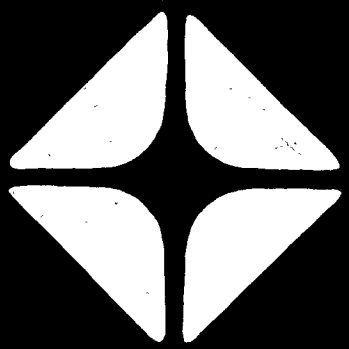
ARCO METALS COMPANY

FACILITIES MANUAL

ARCO ALUMINUM
COLUMBIA FALLS, MONTANA



ARCO Metals Company
TECHNOLOGY/ENGINEERING

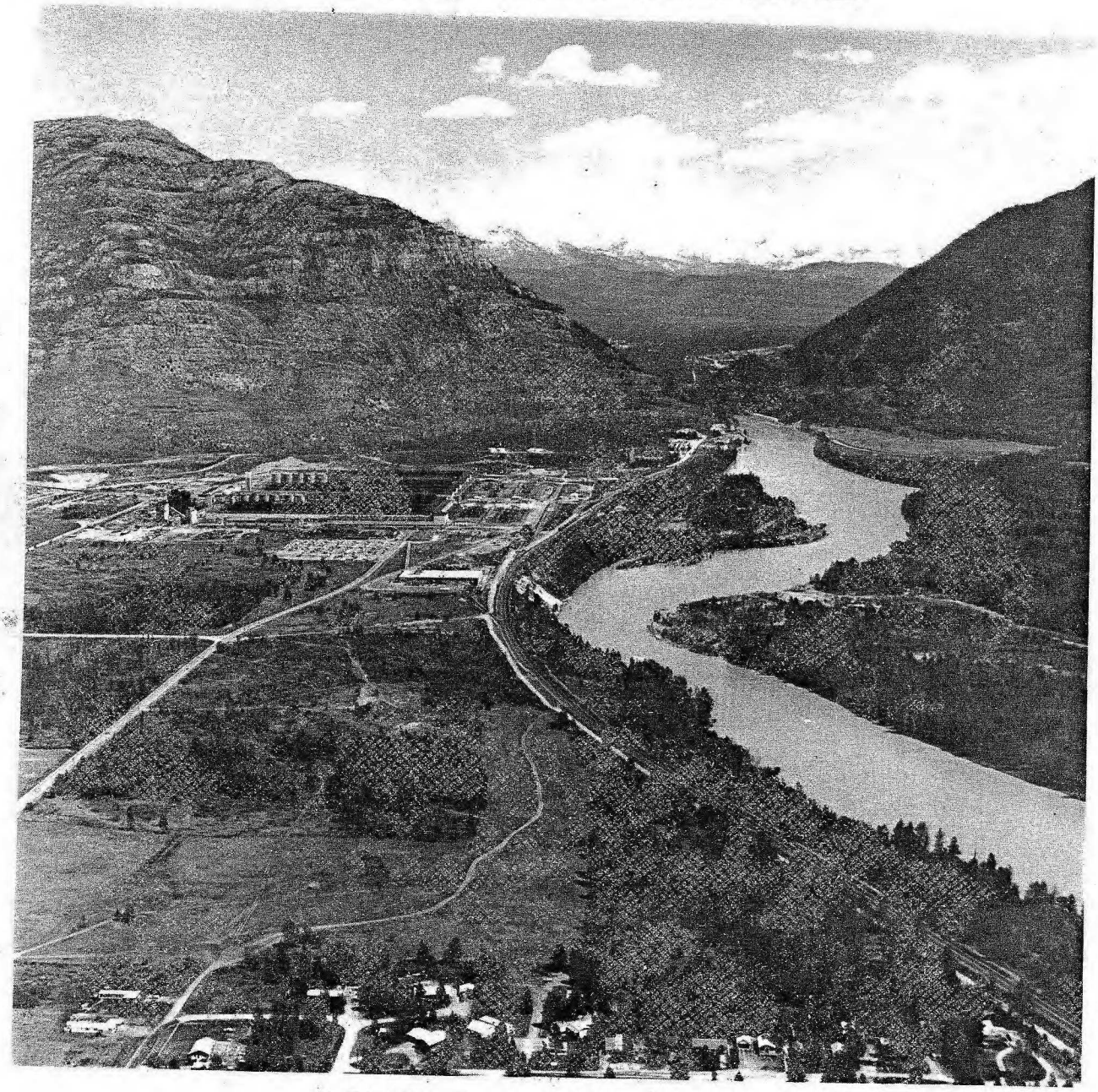
ARCO
Metals
Company

FACILITIES MANUAL

ARCO ALUMINUM
COLUMBIA FALLS, MONTANA

TECHNOLOGY/
ENGINEERING

ARCO METALS COMPANY
FACILITIES MANUAL



ARCO ALUMINUM

COLUMBIA FALLS REDUCTION FACILITY

ALUMINUM DRIVE

P.O. BOX 10

COLUMBIA FALLS, MONTANA 59912

(406) 892-3261

ARCO METALS COMPANY

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION I

FACILITY HISTORY

ARCO METALS COMPANY
ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

FACILITY HISTORY

A. CHRONOLOGICAL EVENTS:

May 10, 1950	Harvey Machine Co., Torrence, CA, first acquired options for an aluminum plant in the Flathead Valley.
November 6, 1951	Anaconda Copper Mining Co. acquired 95 percent of Harvey's interests.
January 1952	Building site changed from Rose Crossing, 6 miles N.E. of Kalispell, to the present site at the base of Teakettle Mtn., 2 miles N.E. of Columbia Falls.
August 30, 1952	Anaconda Copper Mining Co. announced that it would build a $45,000,000 (actually became $65,000,000) Aluminum Reduction Plant with two potlines, two miles N.E. of Columbia Falls, Montana near Teakettle Mountain.
September 9, 1952	Anaconda purchased the first tract of land from Bernard S. Tracy. Land prices for the site ranged up to $25 per acre.
September 16, 1952	Wixton Crowe started clearing the first 101 acres.

COLUMBIA FALLS FACILITY HISTORY
(continued)

October 1, 1952	President Harry S. Truman dedicated Hungry Horse Dam, one of the plant's energy sources.
April 1, 1953	Temporary Anaconda Aluminum Co. offices opened in an old Bank of Columbia Falls Building.
May 18, 1953	J. A. McNeil Co., Alhambra, CA. was awarded excavating and foundations contract.
May 22, 1953	Columbia Falls Chamber of Commerce recognizes Anaconda Aluminum personnel at a dinner in their honor.
June 9, 1953	Ground Breaking Ceremony
July 9, 1953	Foley Brothers, Pleasantville, N.Y. awarded general contract.
February 13, 1954	First building occupied, a 32,580 square foot warehouse building.
April 2, 1955	Steel erection completed by American Bridge and Iron and Vinnell, Inc.
May 11, 1955	First boxcar of alumina arrived at plant and was unloaded using wheat unloading techniques.
August 12, 1955	First aluminum produced.
August 15, 1955	Plant dedication ceremony (2500 attended the program, 5,500 toured the plant).

COLUMBIA FALLS FACILITY HISTORY
(continued)

August 17, 1955	A. F. of L. Aluminum Workers petitioned the National Labor Relations Board for an election to certify the A. F. of L. as the bargaining agent at the new plant.
August 25, 1955	First car load of aluminum shipped from the plant.
November 21, 1955	National Labor Relations Board held election at the plant with production and maintenance workers favoring Aluminum Workers Council A.F.L. over United Steel Workers C.I.O. by a vote of 281 to 147.
January 16, 1956	Local 320 AFL - CIO received their charter.
April 10, 1956	Contract signed between Anaconda Aluminum Company and Aluminum Workers Trades Council AFL - CIO.
April 15, 1963	Third Pot Line expansion announced.
February 1964	Construction started on third potline.
June 10, 1965	Anaconda announced plans to build Potline #4.
August 16, 1965	Third Potline dedicated, increasing capacity from 67,500 tons per year to 100,000 tons per year.

COLUMBIA FALLS FACILITY HISTORY
(continued)

August 11, 1966	Anaconda announced plans to build Potline #5. Construction started for both Potlines #4 and #5 which would increase capacity from 100,000 tons to 180,000 tons per year.
August 3, 1968	Fourth potline went into operation.
October 1968	Fifth potline went into operation.
February 11, 1977	Construction started on the installation of Sumitomo Technology, a $42,000,000 project designed to reduce emissions and power consumption and improve materials handling and working conditions.
March 10, 1980	All 600 cells modernized with Sumitomo Technology.
February 1982	Anaconda announced plans to build a new Casting Facility in order to cast large ingots required for the new rolling mill located in Logan County, Kentucky.
July 2, 1982	Announcement made consolidating Anaconda Aluminum Company and Anaconda Industries into one company to be called ARCO Metals Company.
August 1, 1982	Anaconda Aluminum Company and Anaconda Industries merged to form ARCO Metals Company.

COLUMBIA FALLS FACILITY HISTORY
(continued)

B. Brief History:

As the 1948-1953 Hungry Horse Dam project grew to a close, major concerns emerged over the impact on the Flathead economy. The Hungry Horse Dam was the first major Federal Dam to be built after World War II and many of the construction workers were ex-servicemen with young families.

The Flathead's desire to get an aluminum plant in order to avoid population migration due to the dam's completion was supported by labor organizations and local community groups. Encouragement came when Harvey Machine Company of Torrence, California first acquired options for an Aluminum plant in the Flathead on May 10 and 11, 1950 and shortly after, purchased 1000 acres six miles north of Kalispell at Rose Crossing.

Unfortunately, Harvey was unable to obtain financing to build the plant, but on November 6, 1951, Anaconda Copper Mining Company announced that it had acquired 95 percent of Harvey's interests.

Despite U. S. Department of Justice Federal Trade Commission concerns over Anaconda Copper Mining Company, one of the three big copper producers, becoming the fourth producer of aluminum and other "political string pulling" to prevent construction of the new Anaconda Aluminum Company plant, plans for construction continued due to intervention by President Harry S. Truman who directed that development of the plant continue.

On August 30, 1952, C. F. Kelly, Chairman of the Board, Anaconda Copper Mining Co. announced that Anaconda would build its $45,000,000 (actually became $65,000,000) aluminum reduction plant two miles N.E. of Columbia Falls near Teakettle Mountain. On September 9, 1952, the first actual land purchase was made from Bernard S. Tracy.

Site clearing started two weeks later, September 16, 1952. Two years and eleven months later the first aluminum was produced, August 12, 1955.

Initial construction consisted of two Pot Lines with an annual capacity of 67,500 tons.

COLUMBIA FALLS FACILITY HISTORY
(continued)

Ten years later, in 1965, a third Pot Line was added, increasing production to 100,000 tons.

A fourth Pot Line was started up on August 3, 1968 with the fifth line going into operation in October 1968. These lines increased production to 180,000 tons per year.

In 1976, Anaconda purchased Sumitomo process technology designed to improve plant safety and industrial hygiene, improve production efficiency, cut carbon and chemical consumption, reduce plant emissions and conserve energy.

This $42,000,000 project was started on February 11, 1977 and conversion completed March 11, 1980.

II

ARCO METALS COMPANY

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION II

COMMUNITY PROFILE

COMMUNITY PROFILE

COLUMBIA FALLS, MONTANA

LOCATION:

Columbia Falls, Montana is located in Flathead County which is located in the Flathead Valley in Northwestern Montana. It is southwest of Glacier National Park and immediately north of Flathead Lake, one of the largest natural bodies of fresh water west of the Mississippi River. Missoula is 125 miles south, Great Falls is 225 miles east, Spokane is 255 miles west and the Canadian border is 62 miles north.

CLIMATE:

Average Mean Temperature.	.41.6°F
Highest Recorded Temperature. . .	105.0°F
Lowest Recorded Temperature . . .	-38.0°F
Average Annual Percipitation. . .	.15.4in.
Average Annual Snowfall	.69.0in.

ELEVATION:

3037 feet above sea level

POPULATION:

Columbia Falls	3,100
Flathead County	45,000

HOUSEHOLD INCOME:

Kalispell (1981)	$15,112
Flathead County (1981)	$15,557

RETAIL SALES:

Columbia Falls	not available
Flathead County	not available

SCHOOLS:

One Public Elementary School System in Columbia Falls.
Five Satellite Public Elementary Schools in Canyon area.
One Satellite Public Junior High Shool.
One Satellite Public High School.

COLUMBIA FALLS COMMUNITY PROFILE
(continued)

HIGHER EDUCATION IN THE STATE OF MONTANA:

Two four-year Universities-Public.
Four four-year Colleges-Public.
Three four-year Colleges-Private.
Six Vocational-Technical Schools (State).
Three Community Colleges.(One is Flathead Valley Community College in Kalispell.)

HOSPITALS:

North Valley Hospital, Inc. - Whitefish, 10 miles
Kalispell Regional Hospital - Kalispell, 22 miles

LIBRARIES:

A branch of the county library is located in Columbia Falls.

TRANSPORTATION:

Highways: US 93 & US 2

Bus: Intermountain Transportation
Brown Bus Lines

Rail: Burlington Northern, Inc.
Amtrak

Air: Glacier International Airport
Frontier Airlines
Western Airlines
Cascade Airlines

Water: Flathead River (small craft navigation only).
Flathead Lake

UTILITIES:

Electric: Flathead Electric Co-op (Residential)
Monthly Meter Fee - $6.00
Energy Charge - 3.82¢ per kwh
Pacific Power & Light Company (Residential)

	Summer (Apr 26-Oct 25)	Winter (Jan 1-Apr 25 Oct 26-Dec 31)
first 300 kwh -	2.340¢ per kwh	2.340¢ per kwh
	3.878¢ per kwh for next 300 kwh	3.878¢ per kwh for next 1000 kwh
all over -	5.175¢ per kwh for additional kwh	5.783¢ per kwh for additional kwh

Bonneville Power Administration
(Industrial Wholesale)

2.57% average - January-December 1983

COLUMBIA FALLS COMMUNITY PROFILE
(continued)

Gas: Montana Power Company (Residential)
1982 Rates - $3.439/mcf Nov-Feb
$4.585/mcf Mar-Oct

Water/Sewage: Water from two springs and two wells.
Storage 1,193,000 Gallons
Pressure 60 PSI
1982 Water Rate:
$1.20/m 1st 10m Gals.
1.10/m 2nd 10m Gals.
1.00/m 3rd 10m Gals.
0.80/m next 50m Gals.

1982 Sewage Rate:
$1.80/m Gals.

COMMUNICATIONS:

Telephone:
- Northwestern Telephone Systems, Inc.

Newspapers:
- The Hungry Horse News
- Kalispell News
- Whitefish Pilot
- Kalispell Daily Inter Lake
- 2-other outside papers, (Spokesman, Missoulian, Great Falls Tribune).

Radio:
- Kalispell/6 stations

Television:
- Kalispell/1 station
- Spokane/3 stations
- Missoula/1 station
- Canada/1 station

III

ARCO METALS

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION III

FACILITY DIMENSIONS

ARCO METALS COMPANY
ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

FACILITY DIMENSIONS

FACILITY:

ARCO Metals Company
ARCO Aluminum
Primary Operations
Columbia Falls Reduction Facility
P. O. Box 10
Columbia Falls, Montana 59912
406/892-3261

LOCATION:

The plant is located at the base of Teakettle Mountain, approximately two miles northeast of Columbia Falls, Montana.

HOTEL ACCOMMODATIONS:

Name	Address/Phone	Direction From Plant
Outlaw Inn/Best Western	1701 Highway 93 South, Kalispell / 755-6100	22 miles south
Red Lion Motor Motel	1330 Highway 2 West Kalispell / 755-6700	23 miles south
Ol' River Bridge Inn	Columbia Heights, Highway 2 East, Columbia Falls / 892-2181	7 miles east

AIRPORT INFORMATION:

Name	Distance/Appr. Direction From Plant
Glacier International Airport	10 miles south

SITE AREA:

Fenced Plant Site	220 acres
Buffer Property	3,712 acres
Total Property	3,932 acres

COLUMBIA FALLS FACILITY DIMENSIONS
(continued)

BUILDING AREA:

Manufacturing	1,750,000 sq. ft.
Maintenance	77,800 sq. ft.
Offices	38,400 sq. ft.
Laboratory	6,000 sq. ft.
Warehouse & Shipping	137,000 sq. ft.
Total	2,009,200 sq. ft.

PROCESS:

The electrochemical conversion of alumina into pure aluminum metal using the vertical stud Soderberg process. The casting of that metal into various types, sizes and alloys of ingot.

PRODUCT:

Primary aluminum ingot in the form of rolling ingot, remelt ingot, and foundry ingot; all in various sizes and alloys.

PRODUCTION CAPACITY:

180,000 tons of aluminum ingot from 5 potlines with 120 pots per line. Total, 600 pots.

MAJOR EQUIPMENT:

600 Reduction Cells (Pots)
9 Furnaces
4 Casting Pits
1 Pig Casting Machine
1 Rod Mill
1 Carbon Plant

ANNUAL SALES:

	Year	Pounds	Dollars
Actual	1979	324,695 M	$ 202,718 M
Actual	1980	333,491 M	245,383 M
Actual	1981	315,129 M	239,406 M
Actual	1982	231,872 M	158,776 M
Forecast	1983	136,164 M	N/A M

COLUMBIA FALLS FACILITY DIMENSIONS
(continued)

KEY CUSTOMERS:

Name	City, State	Major Sales Product
ARCO Aluminum	Terre Haute, IN	Sheet Ingot
Amalgamet, Inc.	New York, NY	T-Ingot
Marc Rich, Inc.	New York, NY	T-Ingot
Nichols Homeshield	Davenport, IA	T-Ingot

PRINCIPAL COMPETITORS:

Name	City, State	Principal Product
Alcan	Arvida, Canada	Billet
Alcoa	Pittsburgh, PA	Billet
Alumax	Mount Holly, SC	Billet
Reynolds Aluminum	Messena, NY	Billet
National-Southwire	Hawesville, KY	Billet
Noranda Aluminum	New Madrid, MO	Billet

MAJOR INVESTMENTS:

Original Plant (2 Potlines)	1955	$65,000 M
Third Potline	1965	20,200 M
Fourth & Fifth Potlines	1968	42,300 M
Sumitomo Technology	1980	42,000 M

CURRENT ASSETS: $183,030,725

ANNUAL TAXES: $1,915,948

ANNUAL PURCHASES:

	Dollars	Quantities
Alumina	$61,384,869	439,782,000 pounds
Aluminum fluoride	1,703,314	3,750,200 pounds
Cryolite	2,019,776	5,363,000 pounds
Petroleum Coke	7,718,741	89,992,880 pounds
Pitch	5,992,989	36,915,560 pounds
Coal	142,092	834,100 pounds
Soda Ash	12,118	144,000 pounds
Alloy metals	907,522	985,758 pounds

COLUMBIA FALLS FACILITY DIMENSIONS
(continued)

KEY SUPPLIERS:

Name	City, State	Principal Supply
Reilly Tar & Chemical	Provo, UT	Pitch (Cathode and Anode)
Union Chemical	Los Angeles, CA	Petroleum Coke
Alcoa Chemical	Bauxite, AK	Fluoride and Cryolite
Atlantic Richfield	Los Angeles, CA	Petroleum Coke
Great Western Chemical	Helena, MT	Soda Ash
Airco-Carbide	Calvert City, KY	Anthracite Coal
Alumax	Goosecreek, SC	Cryolite

NORMAL INVENTORY:	Capacity (lbs)	Normal (lbs)
Alumina-Everett	110,000 M	70,000 M
Alumina-Columbia Falls	*170,000 M	105,000 M
Aluminum Fluoride	10,460 M	4,000 M
Cryolite	8,920 M	4,000 M
Petroleum Coke	6,900 M	5,000 M
Cathode Pitch	307 M	150 M
Anode Pitch	4,520 M	3,500 M
Anthracite Coal	786 M	600 M
Soda Ash	80 M	44 M
Graphite	838 M	0
Aluminum in Process		13,200 M
Aluminum (Finish)		5,000 M
Propane		30 M gals.

* Includes 52,000M pounds temporary storage capacity.

EMPLOYEES:

Department	Salaried	Hourly	Total	Annual Payrolls
Reduction	90	383	473	$17,559,013
Technical	40	---	40	1,509,610
Casting	18	49	67	2,799,303
Field Maintenance & Shops	39	187	226	8,996,198
Engineering	19	---	19	706,863
Warehouse & Purchasing	18	9	27	975,780
Administration & EMP Relations	52	---	52	1,898,442
Total*	276	628	904	$34,445,209

* This manpower level was as of December 31, 1982, and reflects a curtailed operating mode.

COLUMBIA FALLS FACILITY DIMENSIONS
(continued)

KEY MANAGEMENT CONTACTS:

	Name	Title
Facility Manager:	Robert A. Sneddon	Plant Manager
Direct/Dotted Line Staff (Facility Mgr.):	L. W. Smith	Operations Manager
	T. F. Payne	Technical Manager
	H. B. Lockhart	Engineering Manager
	J. F. Lopez	Materials Manager
	D. J. McMillan	Special Projects Manager
	A. J. Canavan	Public Affairs Manager
	R. J. Redinger	Employee Relations Manager
	J. B. Miller	Financial Manager

UNIONS: Aluminum Workers Trades Council AFL-CIO

CONTRACT EXPIRATION DATE: September 15, 1983

AVERAGE HOURLY WAGE: $12.60

ENERGY SOURCE:

Energy Type	1982 Annual Usage	Average Unit Cost	1982 Annual Cost
Electricity	1,817,701 MWH	$ .019 /KWH	$34,661,895
Natural Gas	266,470 MCF	4.82 /MCF	1,285,513
Gasoline	78,855 gals.	.08 /gal.	85,033
Distillate	138,015 gals.	1.13 /gal.	155,862
Lube Oil	23,802 gals.	5.00 /gal.	118,902
Coal	663 tons	296.36 /ton	196,493
Petroleum Coke	43,885	175.59	7,706,107
Pitch	18,562	337.63	6,267,144
		Total	$50,476,949

ENVIRONMENTAL CONTROL EQUIPMENT:
10 A-398 Reactor
23 Additional Baghouses

COLUMBIA FALLS FACILITY DIMENSIONS
(continued)

ENVIRONMENTAL CONTROL EQUIPMENT INVESTMENT: $5,543,000

ANNUAL COST OF OPERATING ENVIRONMENTAL CONTROL SYSTEMS: $876,000

SAFETY STATISTICS:

	OSHA RECORDABLE		DAYS AWAY FROM WORK	
YEAR	PLANT	INDUSTRY AVERAGE	PLANT	INDUSTRY AVERAGE
1981	4.63	11.4	0.26	2.6
1982	3.64	8.9	0.099	2.3

COMMENTS ON SAFETY STATISTICS: In 1982, this facility achieved our projected recordable case incident rate goal. This was accomplished under adverse conditions created by curtailed operations.

WAREHOUSING DATA:

LOCATION & PRIME FUNCTION	SIZE	UTILI-ZATION	OWN/ LEASE	COST/YEAR
Main Warehouse	37 M sq. ft.	100%	Own	
Bulk Storage Bldg-Alumina	30 M sq. ft.	100%	Own	
Alumina Storage Building	36 M sq. ft.	100%	Own	
Columbia Falls Warehouse	7.5M sq. ft.	100%	Lease	$ 8,400 M
Port of Everett-Dome	200 M sq. ft.	100%	Lease	

OTHER INFORMATION: 1,967,000 man hours worked without a lost time accident, August 27, 1980 - June 22, 1981. This is a worldwide aluminum history record.

IV

ARCO METALS COMPANY

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

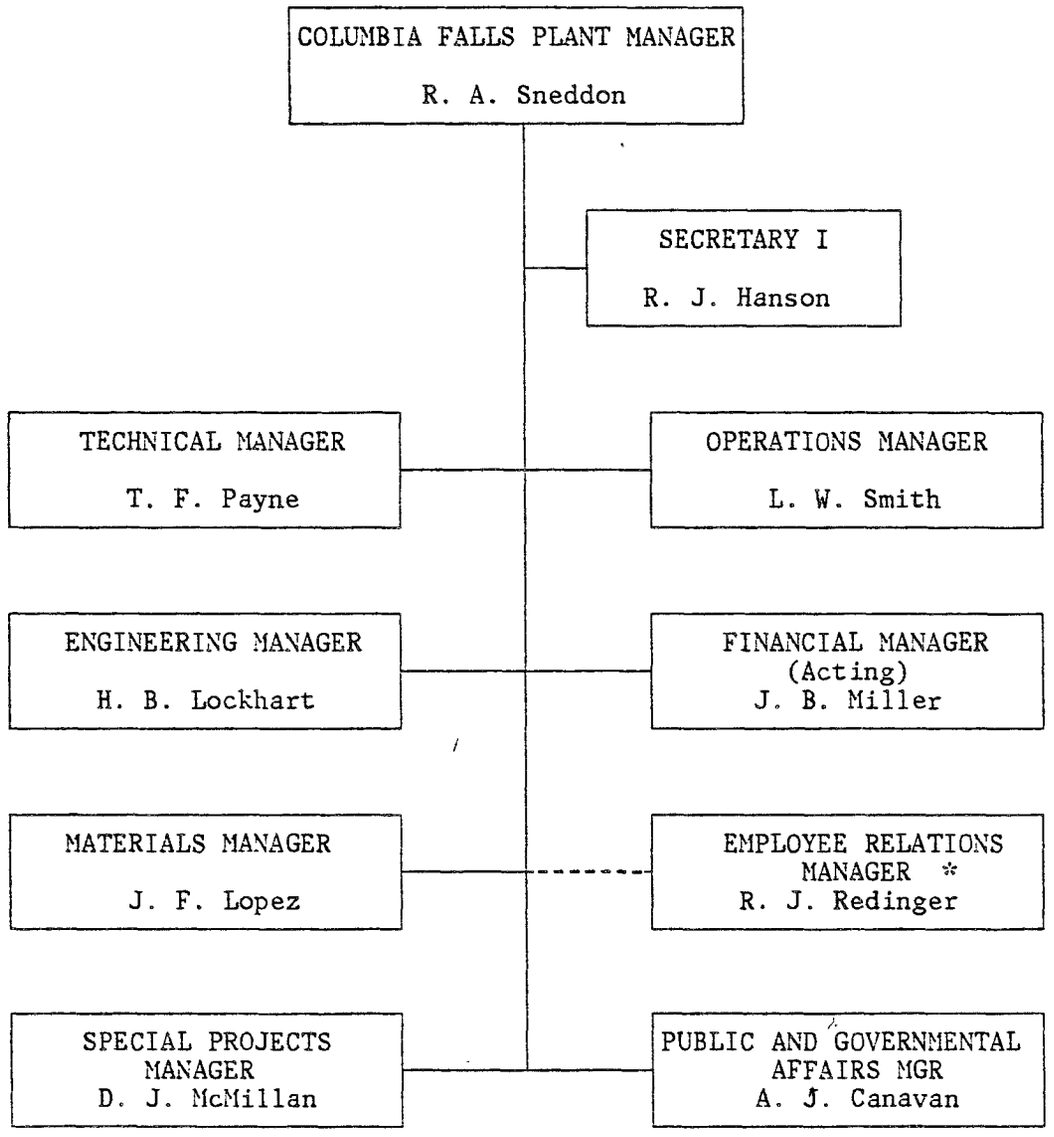
FACILITY

SECTION IV

FACILITY ORGANIZATION

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

PLANT MANAGER

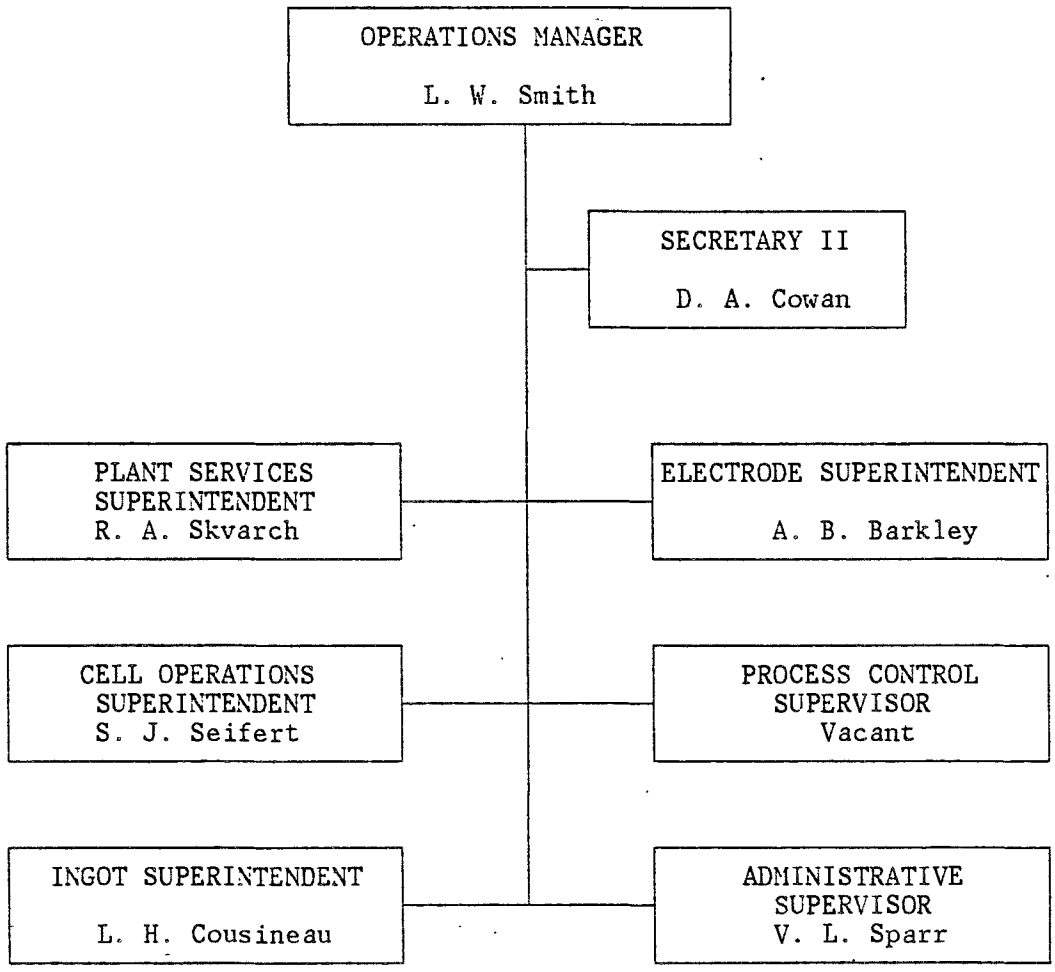


* Reports directly to Employee Relations Manager-Aluminum in Rolling Meadows

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

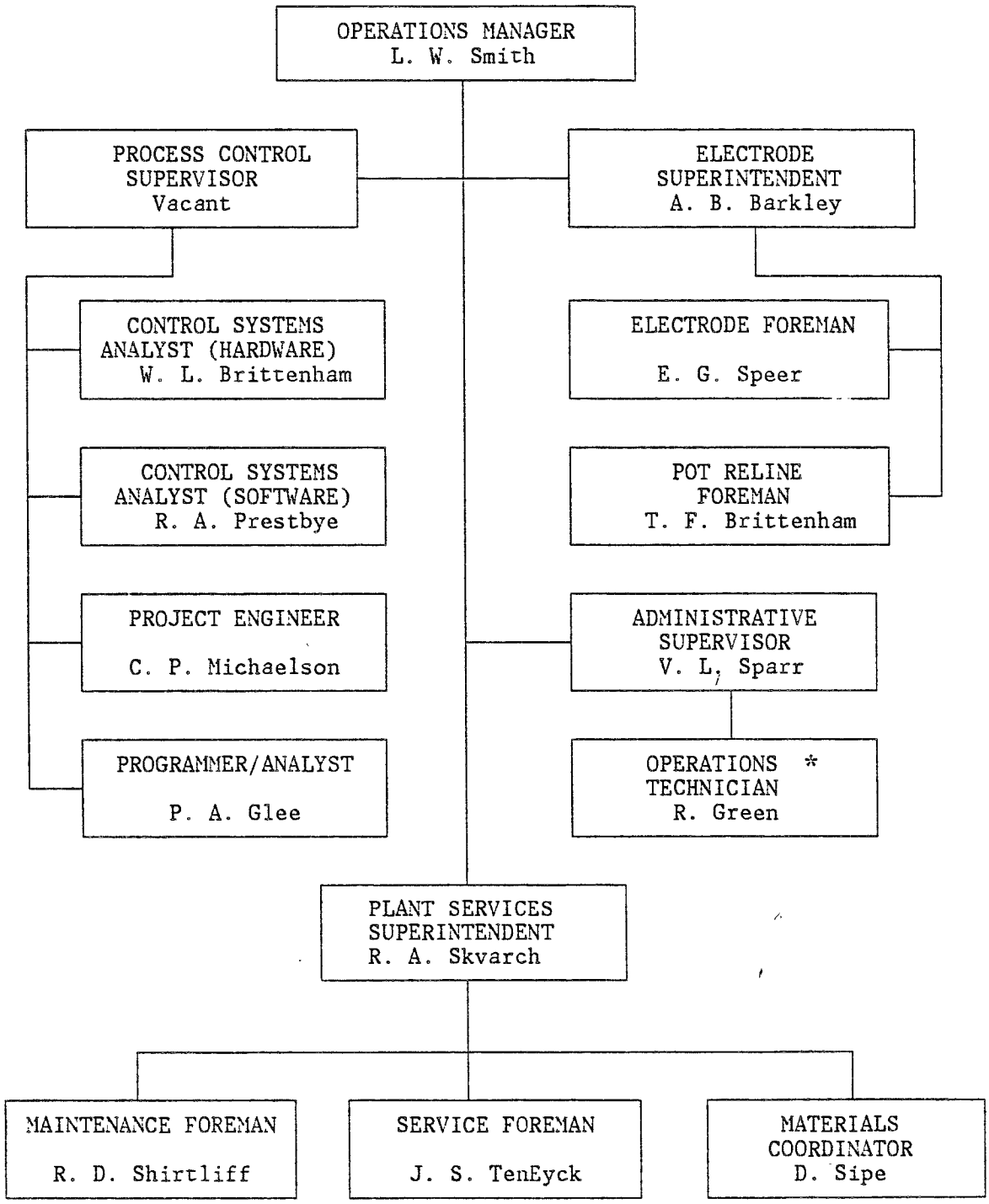
OPERATIONS MANAGER



May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

PROCESS COMPUTER, ELECTRODE, PLANT SERVICES, ADMINISTRATIVE

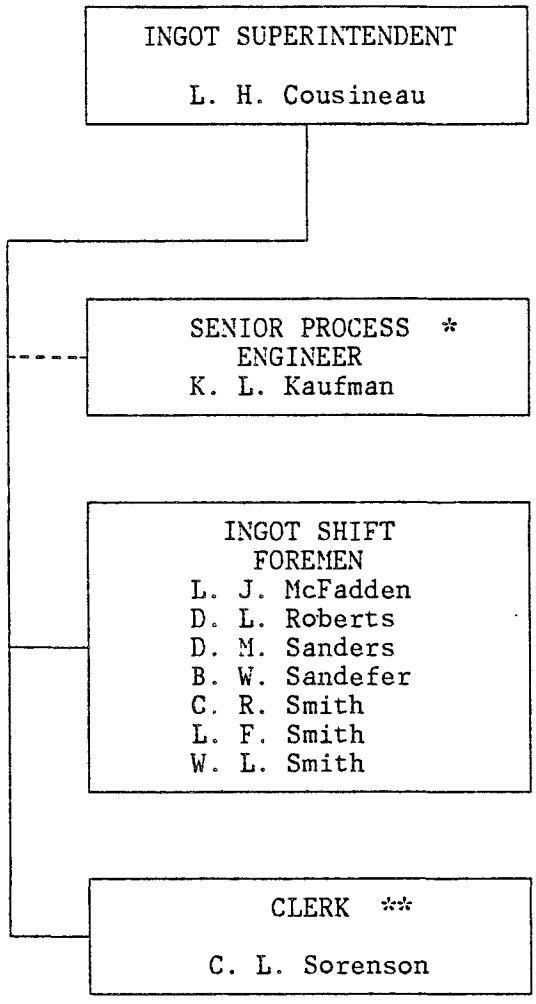


* On Loan from the Technicians' Group, Technical Department

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

CASTING



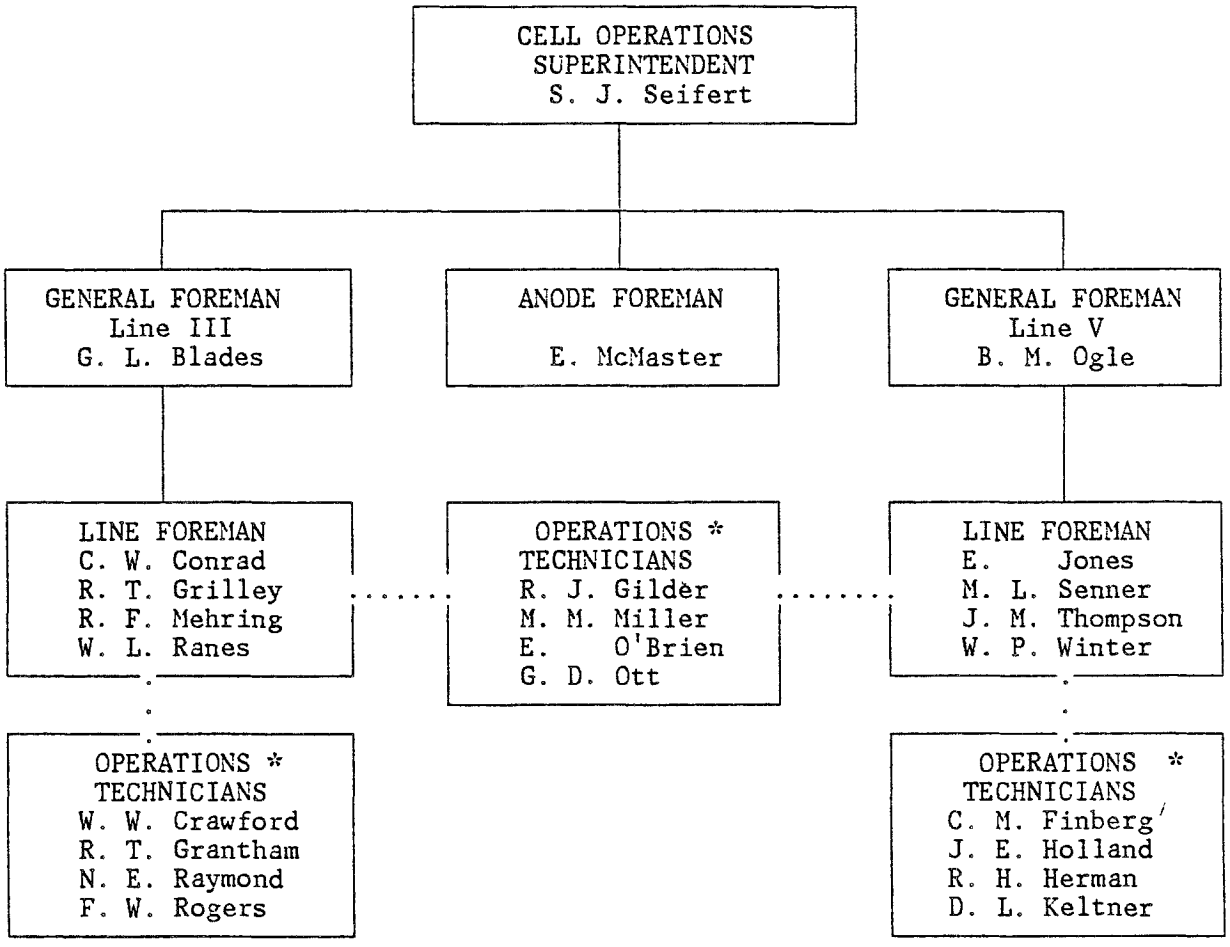
* Administratively reports to Process Engineering Superintendent. Assigned to Ingot Superintendent for technical support.

** Shared with Production Planning Supervisor

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

CELL OPERATIONS

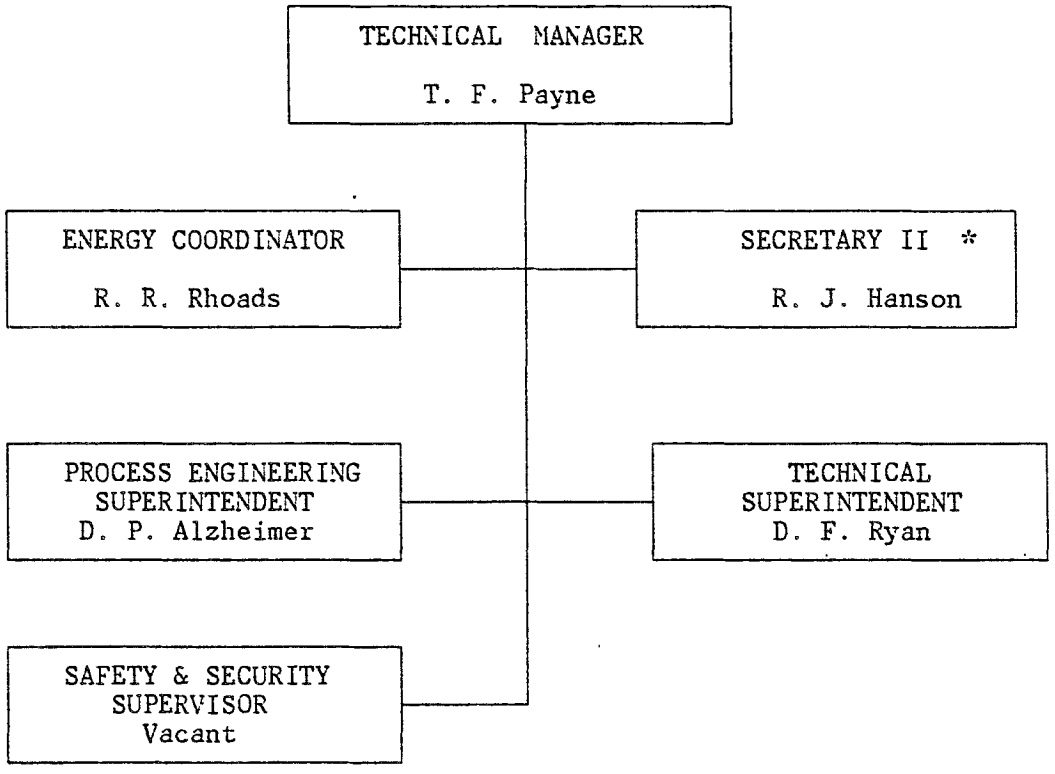


* Administratively Report to the Operations Engineering Supervisor, Technical Department.

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

TECHNICAL OPERATIONS

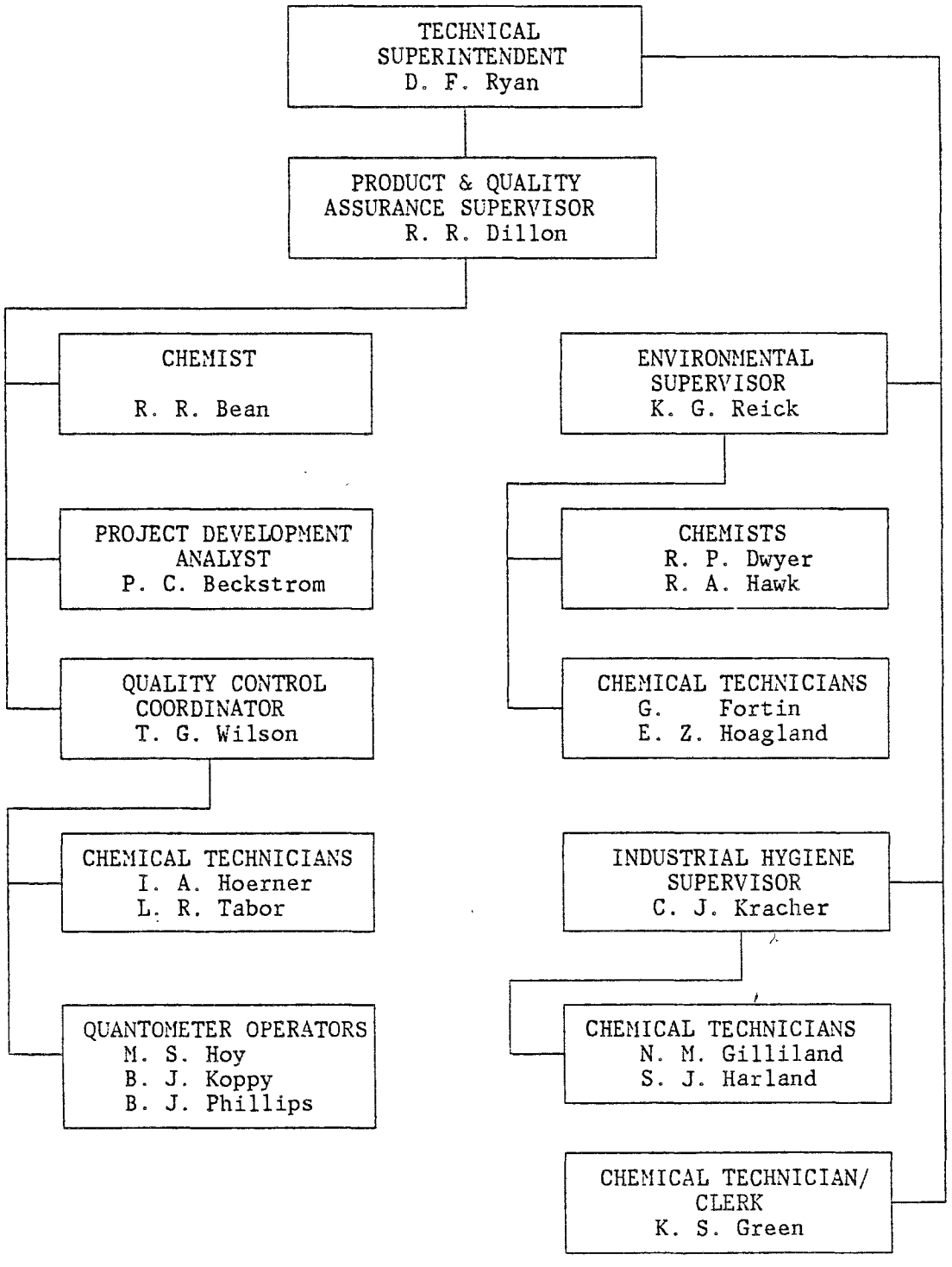


* Also reports to the Plant Manager

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

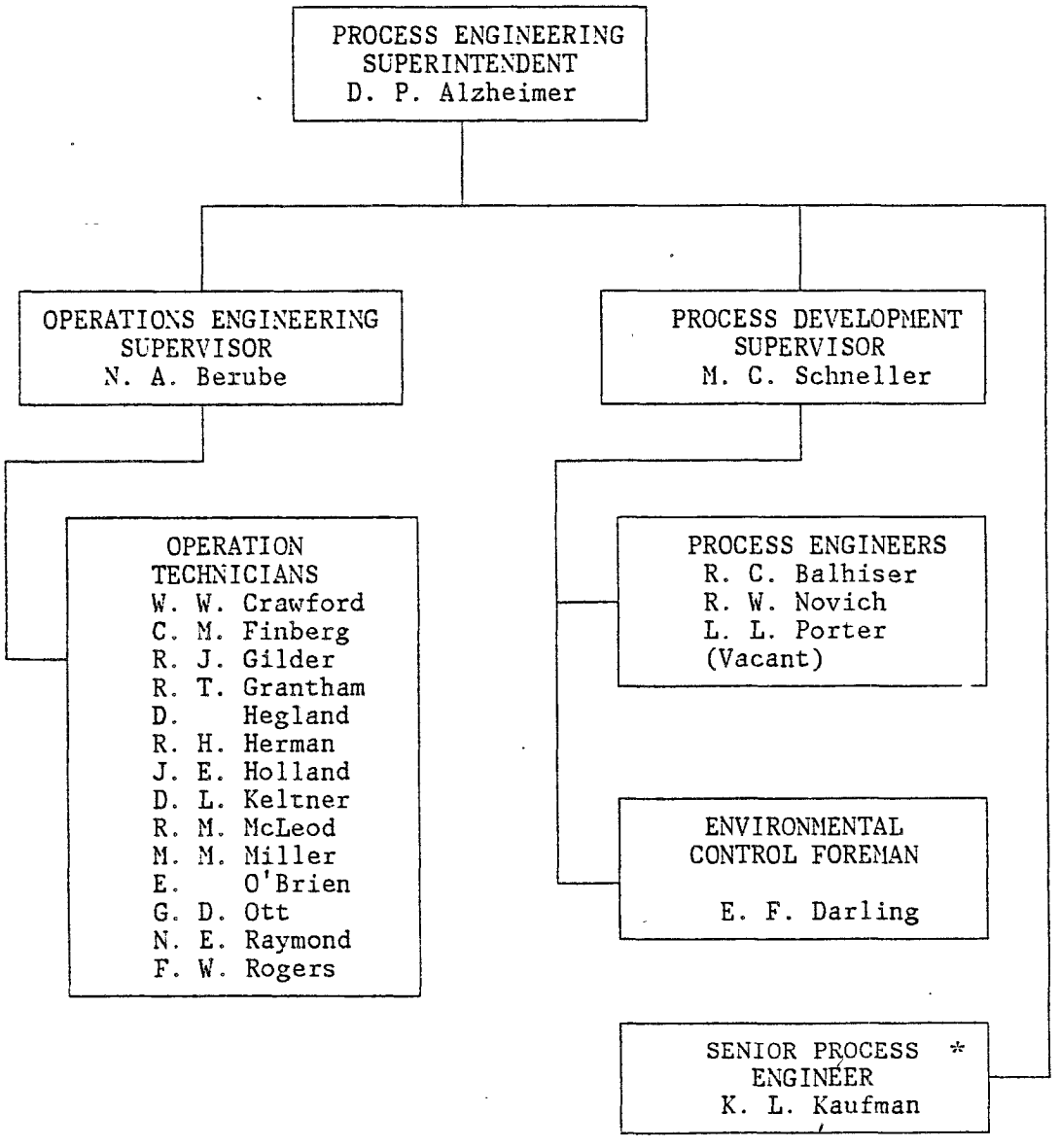
LABORATORY



May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

PROCESS ENGINEERING

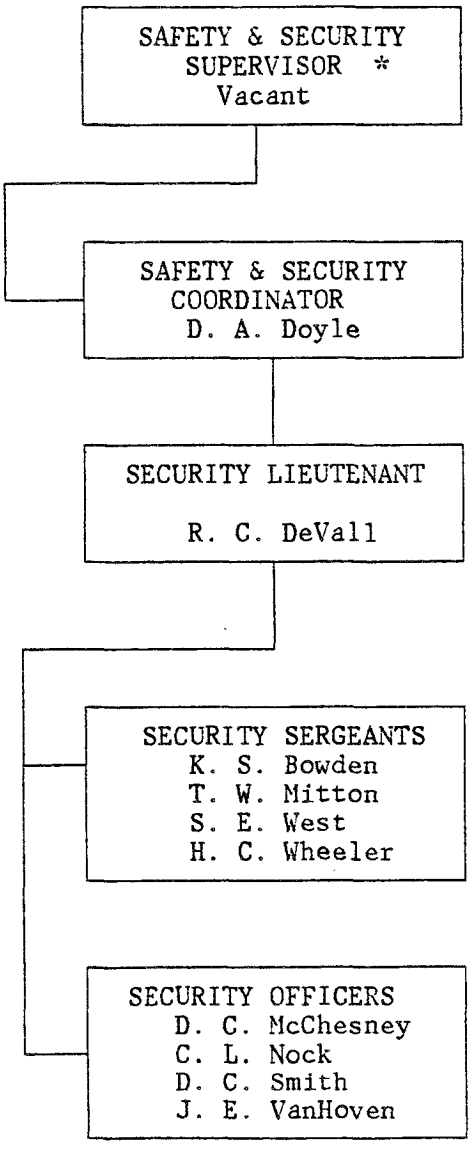


* Administratively reports to Process Engineering Supt. Assigned to Ingot Superintendent. Not counted in this Department.

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

SAFETY & SECURITY

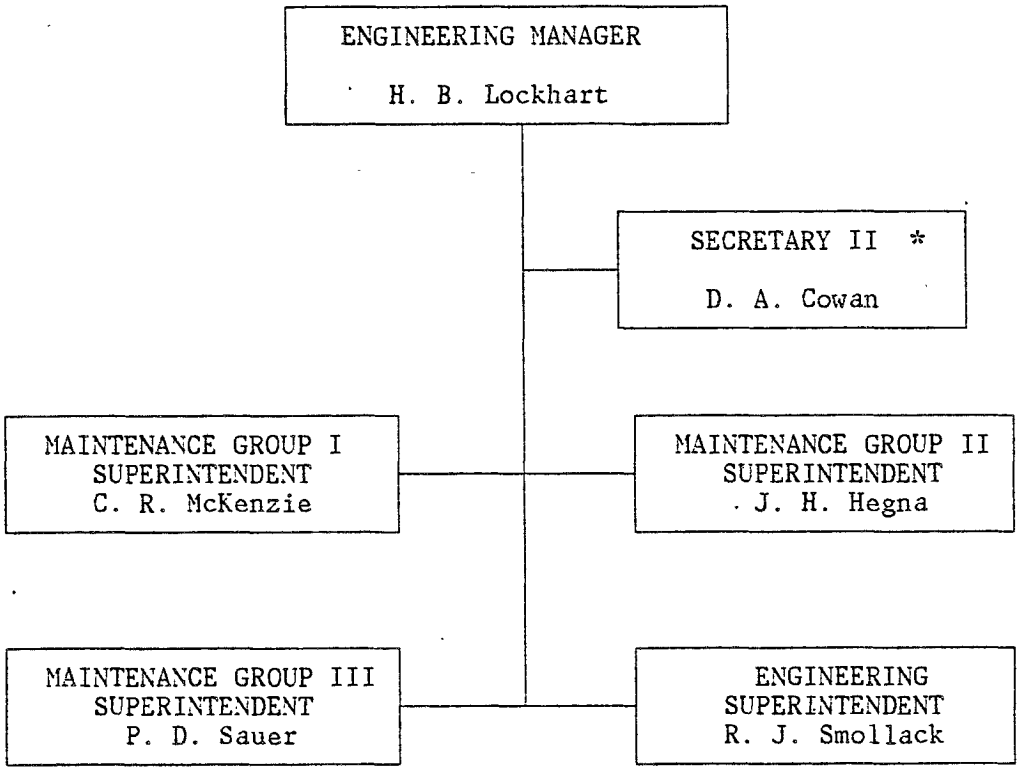


* Vacant--Not included in this count.

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

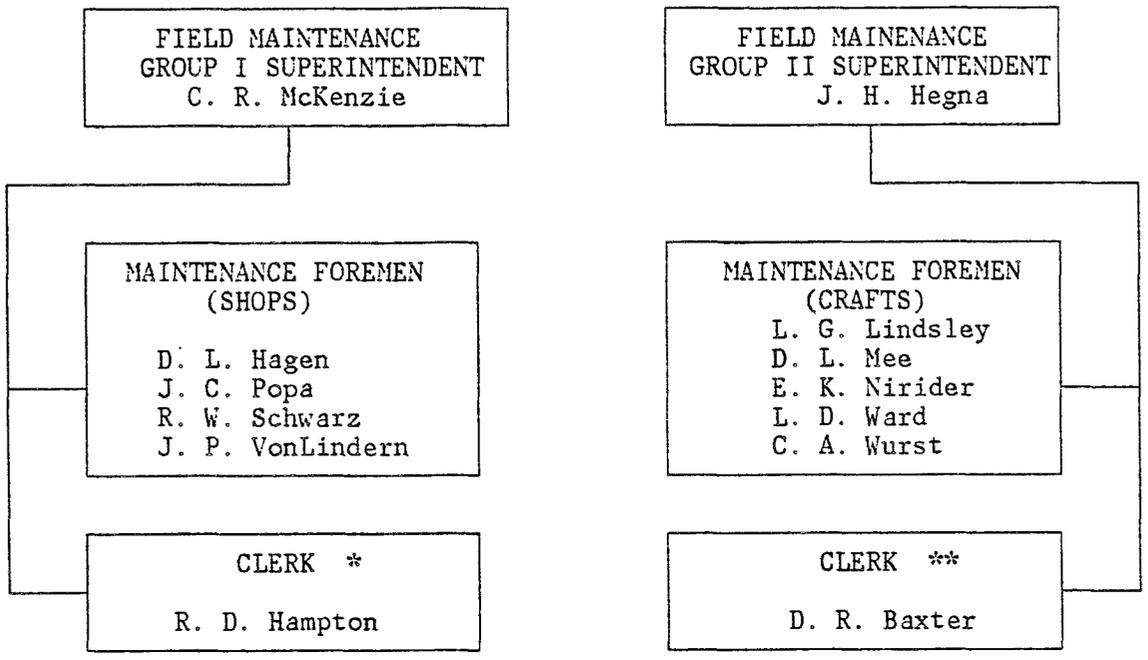
ENGINEERING



May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

FIELD MAINTENANCE



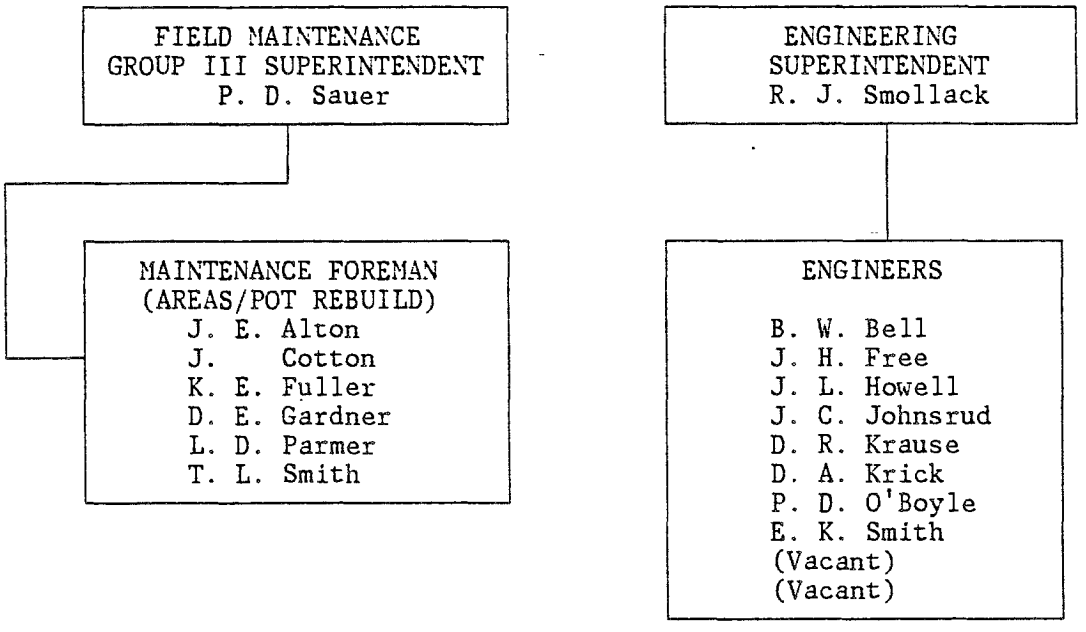
* Shared with Engineering Superintendent

** Shared with Group III

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

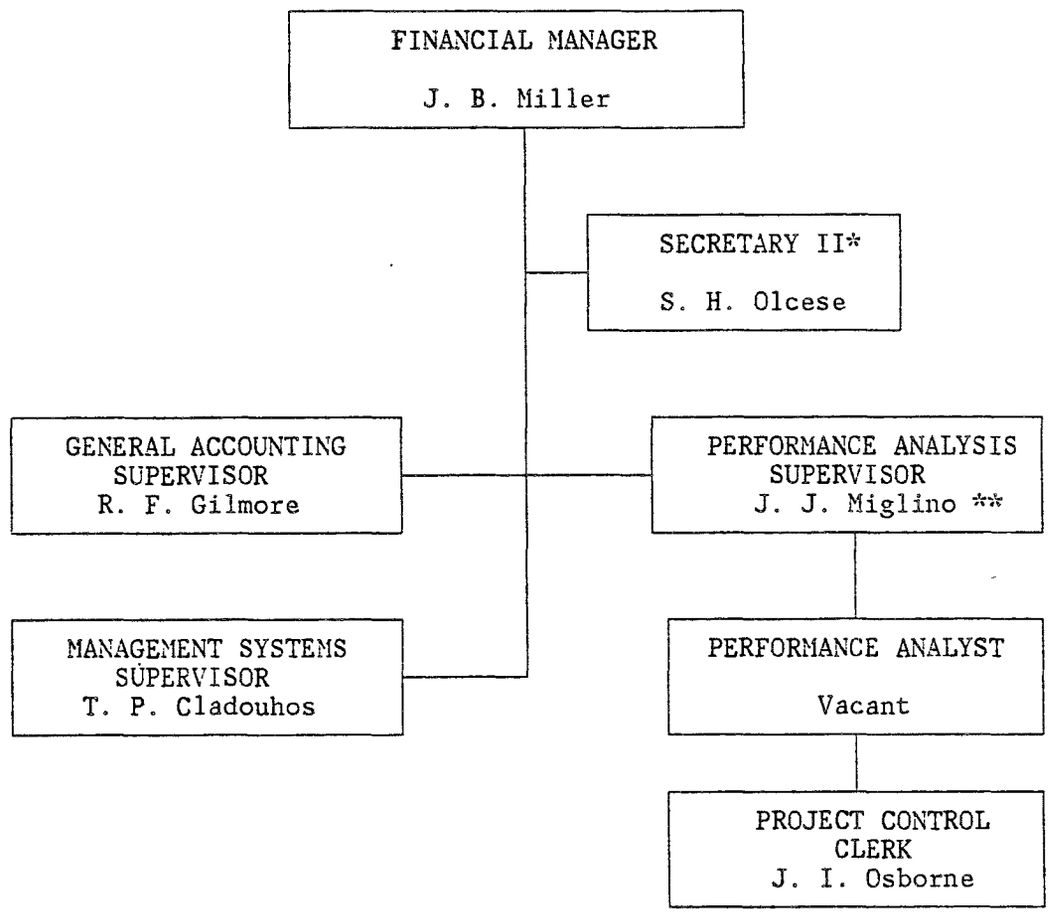
FIELD MAINTENANCE/ENGINEERING



May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

ADMINISTRATIVE

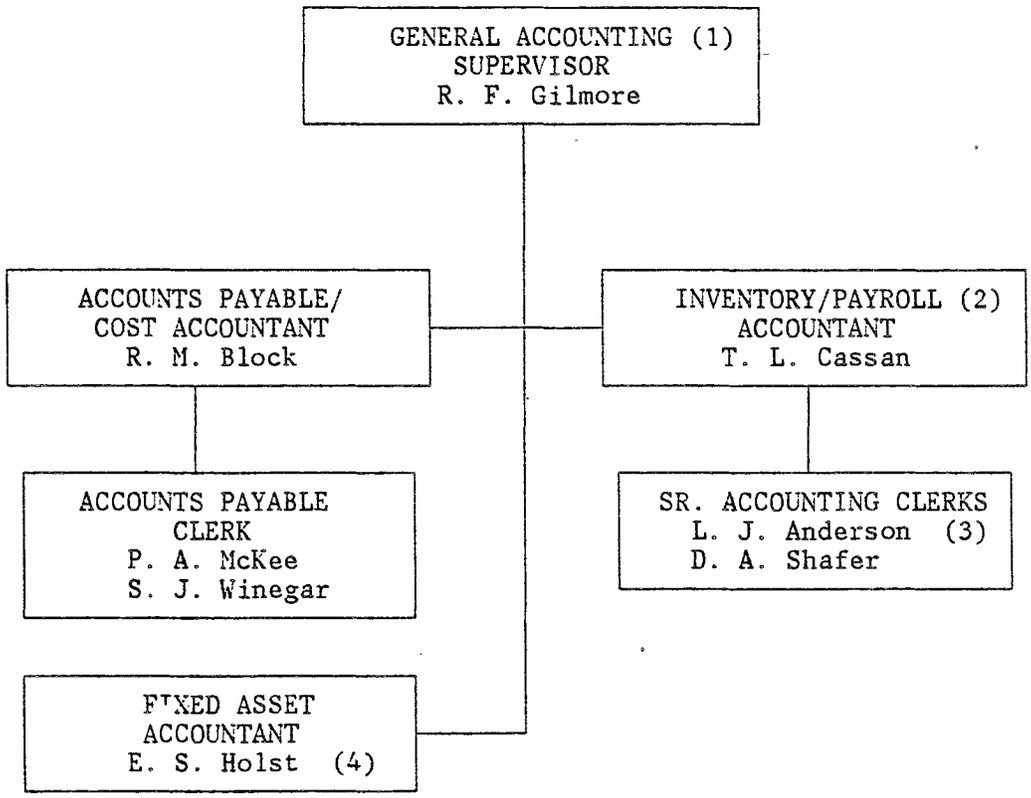


* Also Reports to the Employee Relations Manager
** Acting Performance Analysis Supervisor

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

ADMINISTRATIVE (ACCOUNTING)

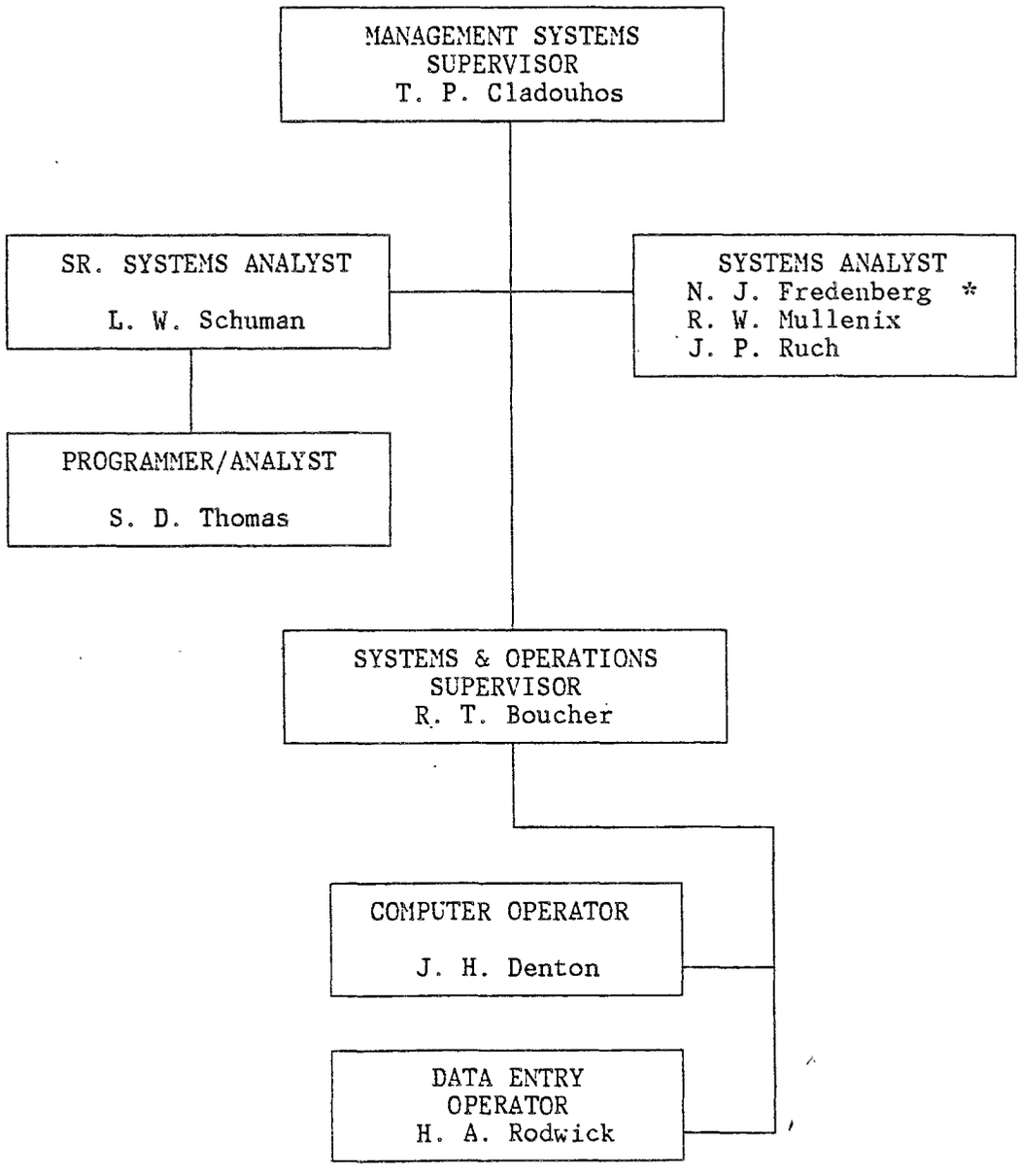


(1) Also fills duties of Staff Accountant
(2) Also supervises hourly payroll
(3) Also fills duties of Switchboard Operator/Receptionist
(4) Also fills duties of Office Services

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

Administrative (Management Systems)

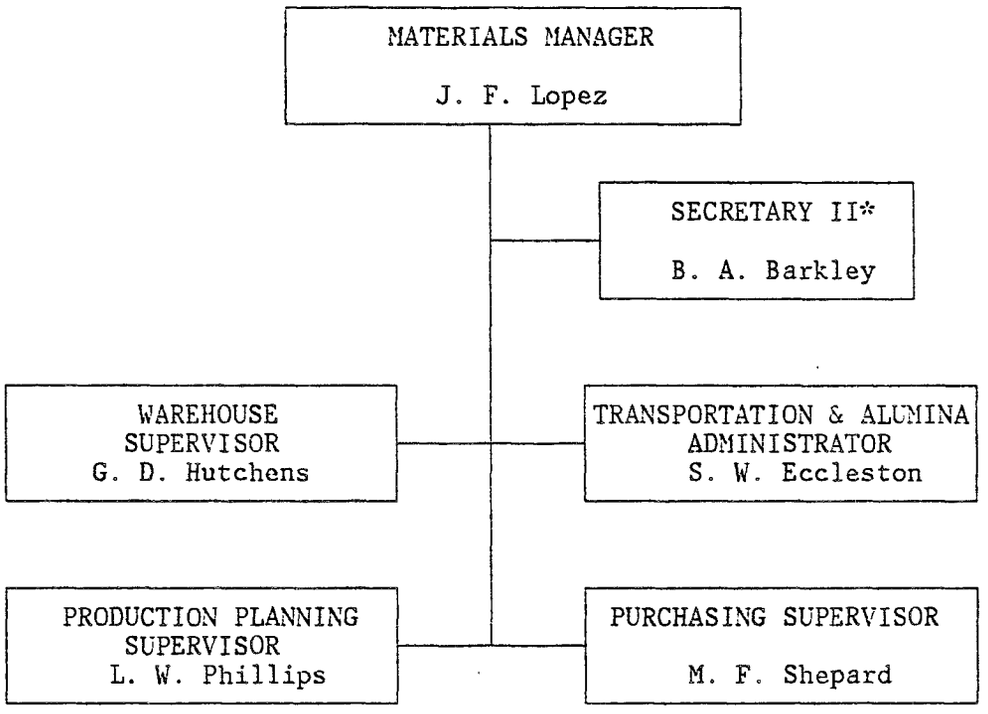


* Also serving as Computer Operations Coordinator

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

MATERIALS

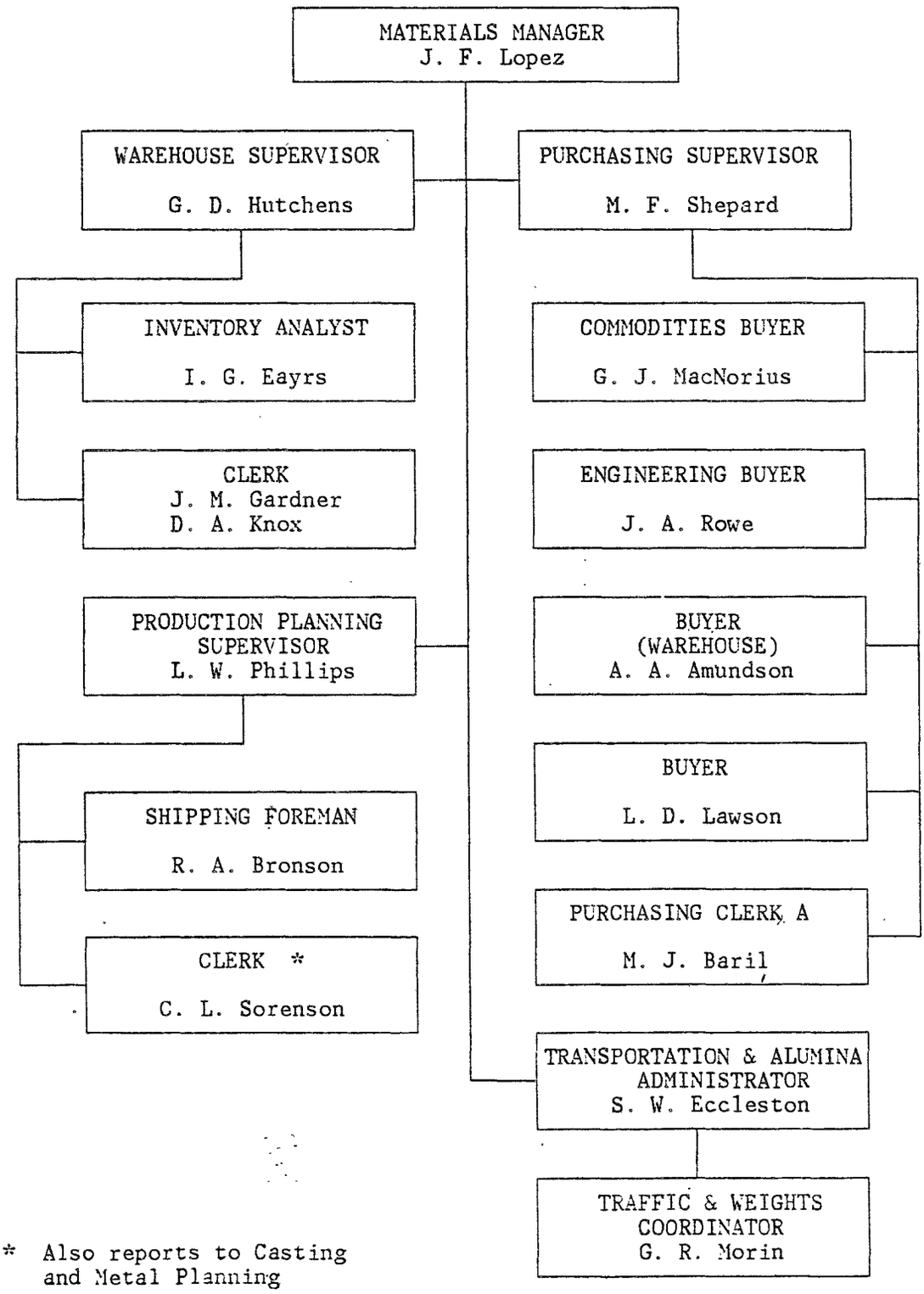


* Also reports to Public & Governmental Affairs Manager and Special Projects Manager

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

WAREHOUSE, PURCHASING, PRODUCTION, TRANSPORTATION

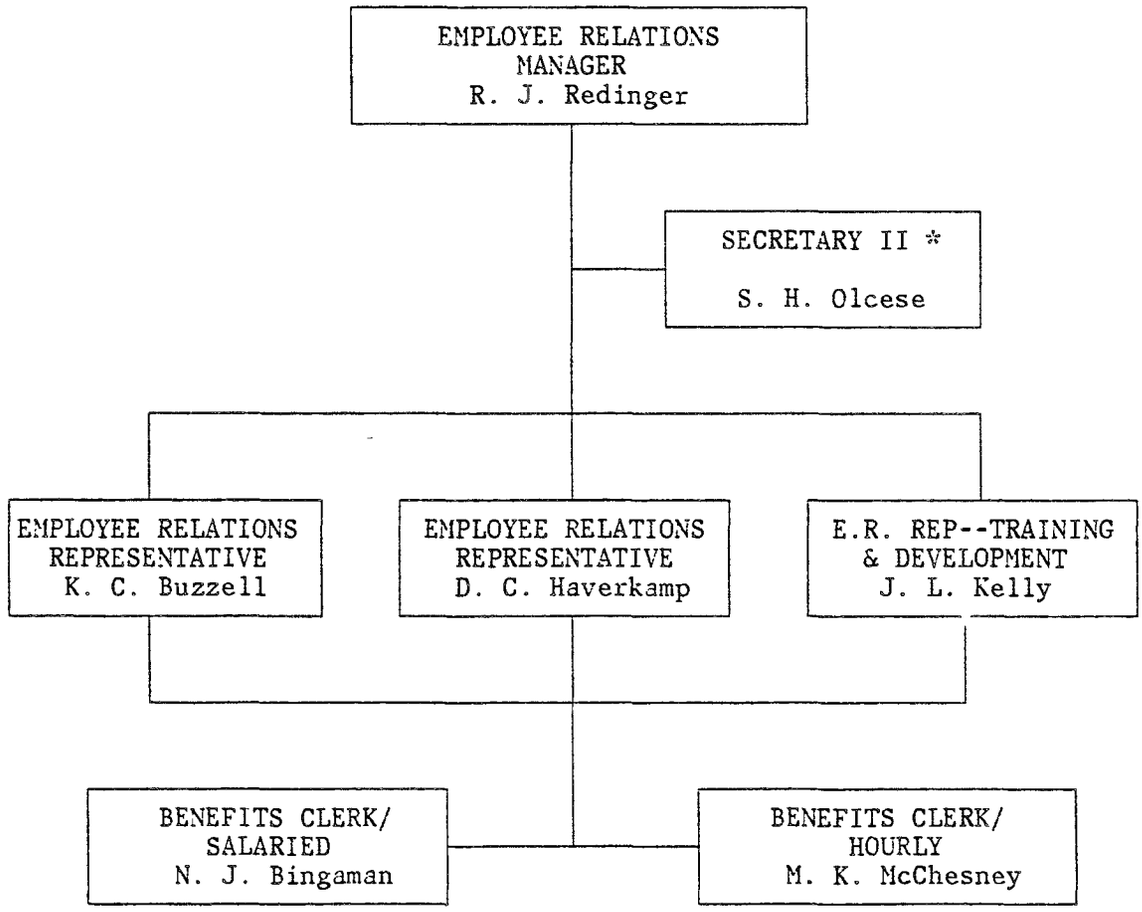


* Also reports to Casting and Metal Planning

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

EMPLOYEE RELATIONS

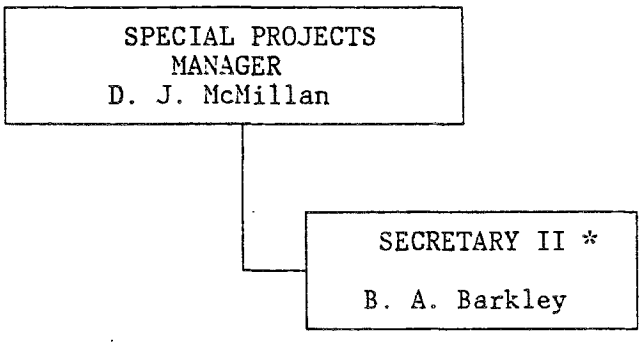


*Also reports to the Administrative Manager

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

SPECIAL PROJECTS

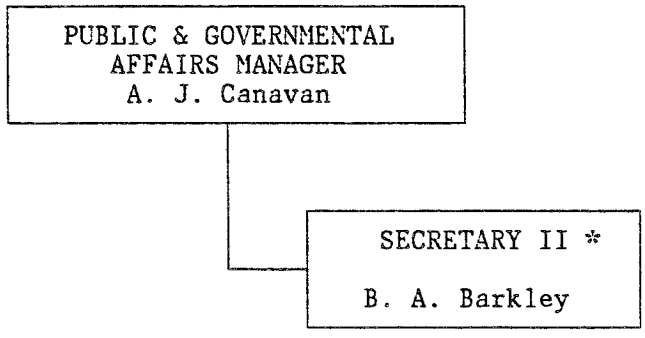


* Also reports to the Public & Governmental Affairs Manager and the Materials Manager

May 1, 1983

ATLANTIC RICHFIELD COMPANY
ARCO ALUMINUM COMPANY
Primary Operations
Columbia Falls

PUBLIC & GOVERNMENTAL AFFAIRS



* Also reports to the Special Projects Manager and the Materials Manager.

May 1, 1983

ARCO METALS COMPANY

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION V

DESCRIPTION OF PRODUCTION PROCESS

ARCO METALS COMPANY
ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

DESCRIPTION OF PRODUCTION PROCESS

I. Process:

Our Paste Plant produces both anode and cathode carbon paste materials to perpetuate the vertical pin Soderberg anodes and to seal the cathode cavity interiors.

The electro-chemical reduction process of alumina occurs in the molten chemical bath layer between the anode and cathode of the aluminum reduction cell (potlines).

Pure molten aluminum metal is cast, by the direct chill process, into various ingot sizes and shapes of specific alloy content.

II. Description:

Alumina is aluminum oxide (Al_2O_3), one of several basic raw materials required to produce aluminum. It is refined bauxite clay taken from the earth's crust by open-pit mining in Australia and shipped from the ports of Gladstone and Kwinana to Everett, Washington.

Ship unloading (clam shell bucket) is 8,000 metric tons per 24 hours. Port of Everett storage capacity is 55,000 short tons.

Railcar loadout is into covered bottom-dump gondola railroad cars at the rate of 2,400 s/t per nine-hour day; average is 1,400 s/t day; five days/week.

Railcar unloading at Columbia Falls is capable of 5,100 s/t/24-hour days; average is 1,400 s/t/eight-hour day; five days/week. Alumina storage capacity is 59,000 short tons.

Petroleum coke and coal tar liquid pitch are used in the manufacture of a carbon paste briquette to replenish burned off anodes at the interface of the anode and cathode during the reduction process. These materials come from a variety of vendors to keep our options open for a steady supply; some of these materials are from sister-company locations.

COLUMBIA FALLS PRODUCTION PROCESS
(continued)

Electricity is a major raw material mostly from the generation of hydro-electric power from the many dams on the Columbia River and its tributaries. Three power transmission lines to our plant in Northwestern Montana (Columbia Falls) come from nearby Hungry Horse, Libby and Noxon Rapids Dams. Bonneville Power Administration is our primary source of our approximate annual usage of 2,748,000 MWH. The electric power provides the source of heat in the A-C gap between anode and cathode; and the D.C. current aids in the electrolytic process. The A.C. current is converted to D.C. current by water-cooled, solid state, Westinghouse silicone rectifiers for potlines 1 & 2; potlines 3, 4 and 5 are equipped with General Electric air-cooled rectifiers.

Anthracite Coal and soft pitch are the materials required to manufacture cathode carbon paste for lining and sealing the cathode interior. The sturdy cathode shell is constructed of steel; the specific design of the interior is composed of various insulation materials and carbon block assemblies. Carbon blocks are shipped in from several vendors and secured to a steel collector bar; these 13 carbon block assemblies in the bottom portion of the reduction cell form the basis for the cathode. Electric current flows from the anode to cathode and out of the cell by the collector bars, into aluminum bus bars and thus to the next cell in electrical series.

Aluminum Fluoride (AlF_3) and Cryolite ($Na_3Al\ F_6$) are the principal chemicals composing the molten bath solution which floats atop a molten aluminum metal pad and in contact with the operational face of the anode. These bath chemicals serve several very important functions in the reduction process, both as a liquid and as a solid. As a liquid, the bath dissociates the alumina to its respective elements, aluminum and oxygen. This separation is necessary prior to the electrolytic process. As a solid, the bath forms a crust to support all raw materials of alumina, chemicals and alloying materials form a positive seal for efficient collection of reduction gases, and pre-heat the materials for safety and operational reasons.

Reduction Cells (600 pots) are equally distributed in each of 10 potrooms; two rooms equal one potline. All bulk storage raw materials are transferred from silo storage to the cells by specially designed vehicles. Dispensing such materials is done by operator control as the vehicles travel parallel to the cell on either front or back sides of the cell. Cells are normally controlled by a process computer but may be individually placed on manual control should it become necessary.

Each cell produces approximately 1,600 pounds of aluminum per day; pots are tapped every other day by siphon principle and the metal is transferred by crucible and fork truck to our centrally located casting department.

Casting the various sized and shaped ingots is done by the direct chill (D.C.) principle; most alloying is done in the holding and casting furnaces based on feedback from the quantometer in our chemical laboratory. Shipments are made primarily by Burlington Northern Railroad; however, truck shipments occur occasionally.

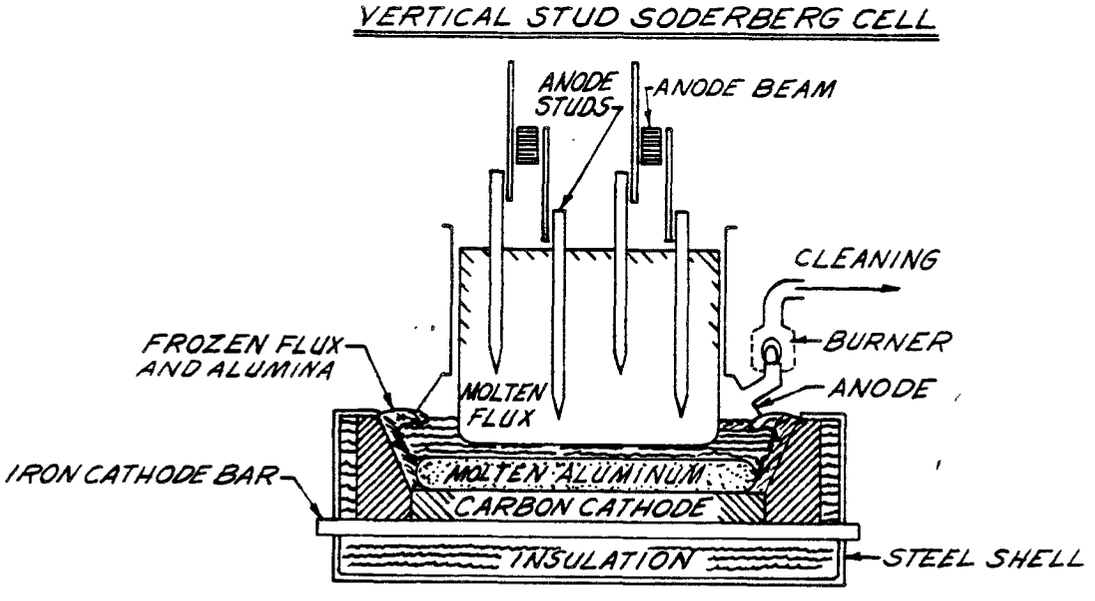
Our plant is unique inasmuch as we operate and maintain our own in-plant switch engine. Our loads and empties are weighed both in and out; our scale is considered one of the best in the Northwest. There is an interchange track at Conkelley siding parallel to Burlington Northern Railroad's main line tracks. Our 1981 freight costs (in and out) by rail only are $20,197,000.

Our service, operating and maintenance departments have a variety of vehicular and power-driven equipment necessary for an aluminum plant of our design. Refer to lists contained in Section VII.

FIGURE 1

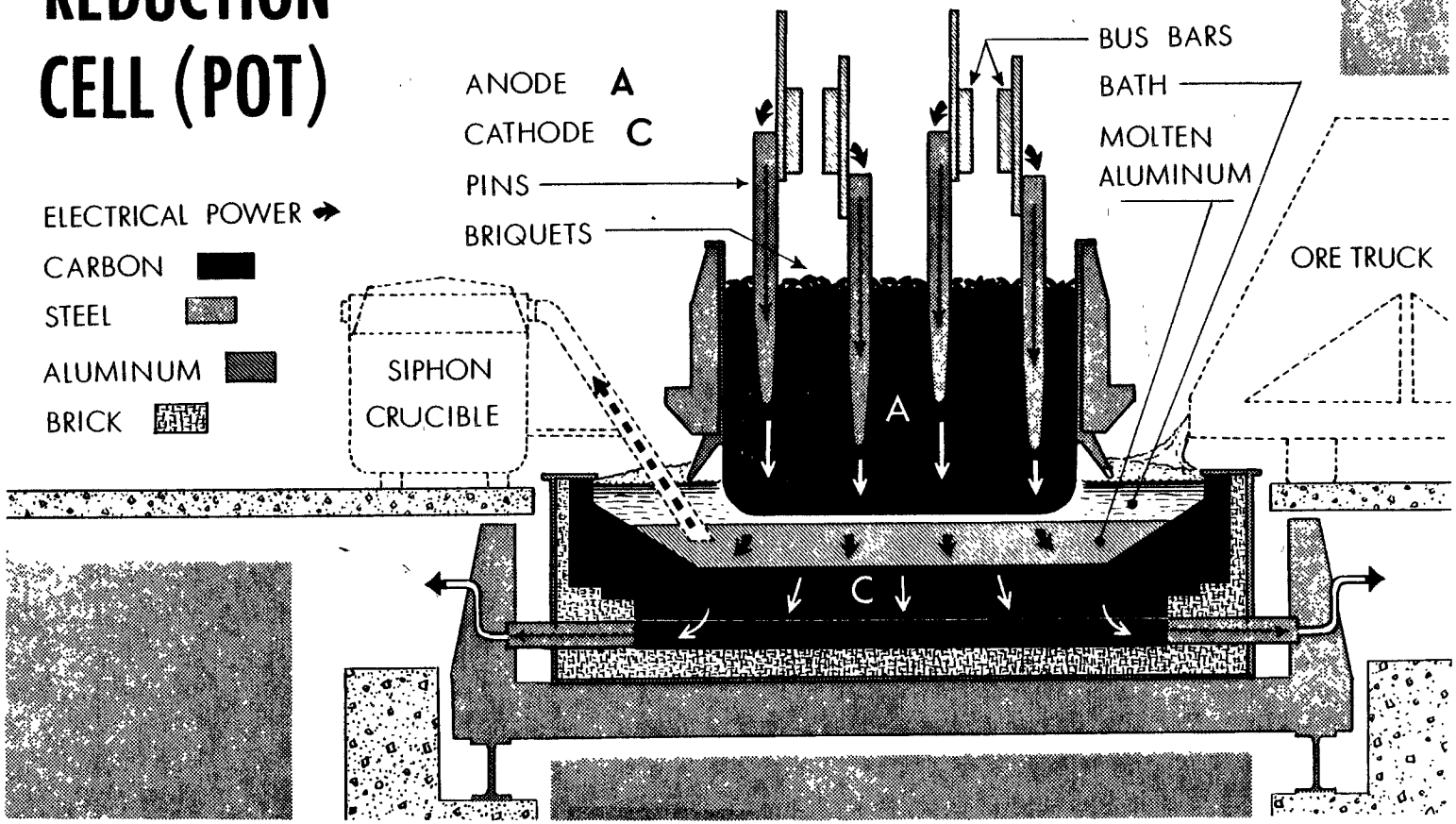
VERTICAL STUD SODERBERG CELL

Alumina (Al_2O_3) is dissolved in molten cryolite (Na_3AlF_6) and is reduced to aluminum metal by direct current electrolysis. The released oxygen rises through the electrolyte and reacts with the sacrificial carbon of the anode, while the molten aluminum settles to the bottom of the reduction cell.



HOW ALUMINUM IS MADE

ALUMINUM REDUCTION CELL (POT)



VI

ARCO METALS COMPANY

ARCO ALUMINUM

FACILITIES MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION VI

SALES AND MARKETING

ARCO METALS COMPANY

ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

SALES & MARKETING

I. PRODUCTS PRODUCED:

PRODUCT	1981 ANNUAL M POUNDS DOMESTIC	EXPORT	INTRACOMPANY	TOTAL	1981 PRODUCT MIX	1981 SALES VOLUME, M$
PIG	195	79	---	274	0.1 %	$ 201
INGOT	9,313	6,318	10,886	26,517	8.4 %	19,450
SHEET	---	---	285,130	285,130	90.5 %	217,667
ROD	---	---	726	726	0.2 %	624
RSI	488	---	1,994	2,482	0.8 %	1,464
TOTAL	9,996	6,397	298,736	315,129	100.0 %	$ 239,406

In 1981 94.8% of Columbia Falls' production was processed through other Anaconda Aluminum Company facilities. 2.03% of the plant's output was exported.

II. MARKET SIZE (Millions of Pounds - 1981)

		MM LBS.	%
Building & Construction	-	2,519	18.8%
Transportation	-	2,138	16.0%
Consumer Durables	-	975	7.3%
Electrical	-	1,130	8.4%
Machinery & Equipment	-	836	6.2%
Containers & Packaging	-	3,511	26.3%
Other	-	689	5.2%
Total Domestic	-	11,998	89.8%
Exports		1,370	10.2%
Total	-	13,368	100.0%

III. MARKET PENETRATIONS

Based on 1981 Market Size of 13,368MM lbs. and Columbia Falls shipments of 315MM lbs., market share was 2.3%.

IV. COMPETITORS

Alcoa
Aeymolas
Kaiser
Revere
Alumax
Consolidated
Howmet
Martin Marietta
Matismal
Southwire
Moranda
Alcan

V. DISTRIBUTION CHANNELS

Primary products are sold on a direct basis to consumers and metal merchants. We have four regional sales areas: Midwest, Central, Northeast/Southeast, and West/Southwest. The bulk of our export sales are through the international metal merchants with some direct sales to Mexico.

V. CUSTOMER BASE (Columbia Falls)

PIG	-	10 Active Accounts
INGOT	-	10 Active Accounts
SHEET	-	Terre Haute and Logan Plants
ROD	-	Miami Extruded Products Plant
R.S.I.	-	10 Active Accounts

PRIMARY REDUCTION OPERATIONS

CUSTOMER SALES BY END-USE MARKET
1982 LONG-RANGE PLAN
(Millions of Pounds)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
BUILDING PRODUCTS:					Ingot by End-Use Market					
Residential - New	27.8	35.0	41.1	30.3	37.0	36.5	32.0	32.0	37.3	36.3
Residential - Remodel	11.9	17.4	24.0	22.5	27.0	21.9	19.2	19.2	21.4	20.4
Non-Residential	7.1	10.2	10.0	8.2	10.0	14.6	12.8	12.8	12.3	11.3
Total	46.8	62.6	75.1	61.0	74.0	73.0	64.0	64.0	71.0	68.0
TRANSPORTATION:										
Automotive	15.4	19.8	33.0	32.3	34.0	52.5	59.0	68.6	73.5	74.5
Truck				7.1	7.0	12.5	13.0	14.8	19.2	20.2
Other	8.1	12.5	10.0	6.5	7.0	10.2	10.6	11.4	14.7	16.7
Total	23.5	32.3	43.0	45.9	48.0	75.2	82.6	94.8	107.4	111.4
CONSUMER DURABLES	22.1	29.9	31.0	10.2	30.0	16.8	16.4	17.3	19.7	19.7
ELECTRICAL	26.4	33.3	22.0	20.8	30.0	21.6	20.8	23.8	25.1	24.1
MACHINERY & EQUIPMENT	4.3	5.2	8.0	7.8	16.0	11.8	11.4	12.3	14.2	14.2
PACKAGING	18.3	17.5	12.0	7.6	6.0	5.6	3.8	3.8	4.6	4.6
EXPORT	14.2	41.0	133.3	45.0	32.4	34.0	44.0	24.0	6.0	6.0
OTHER	2.4	3.7	5.0	3.7	12.0	12.0	12.0	12.0	12.0	12.0
TOTAL	158.0	225.5	329.4	202.0	248.4	250.0	255.0	252.0	260.0	260.0

ARCO METALS

ARCO ALUMINUM

FACILITY MANUAL

PRIMARY OPERATIONS

COLUMBIA FALLS, MONTANA

FACILITY

SECTION VII

EQUIPMENT DETAILS

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

VERTICAL STUD SODERBERG CELL | | |
TYPE OF EQUIPMENT | EQUIPMENT NUMBER | DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE - VERTICAL STUD SODERBERG

MANUFACTURER		MODEL NO.	SERIAL NO.
P.O. NO.	P.O. DATE	EQUIPMENT COST	INSTALLATION COST

EXTERNAL DIMENSIONS : LENGTH _____ WIDTH _____ HEIGHT _____

INTERNAL DIMENSIONS : LENGTH _____ WIDTH _____ HEIGHT _____

WEIGHT : _____

ELECTRICAL REQUIREMENTS: VOLTS _____ AMPS _____

UTILITIES : WATER _____ AIR _____

CAPACITY : _____

PRODUCTION RATE : 1600 lbs. per day per cell

CURRENT RATING : 102,000 Amps

NOMINAL VOLTAGE : 4.9 volts per cell

D. C. KWH : 7.5 D. C. KWH per pound of metal produced

CELLS PER POTROOM : 60

CELL ORIENTATION : Two rows, end to end

LENGTH OF POT ROOM : 10 rooms at 1100 feet

NUMBER OF POT LINES : 5

TOTAL NUMBER OF CELLS : 600

CELL TECHNOLOGY : Anaconda/Pechiney/Sumitomo

ENVIRONMENTAL SYSTEMS : Alcoa 398 Dry Scrubber

ISSUE DATE: 5/82

REVISION: _____

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#3 Mix	Last Rebuild 1969
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 130,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 29' 6" WIDTH 12' 6" HEIGHT 10'

INTERNAL DIMENSIONS : LENGTH _____ WIDTH _____ HEIGHT _____

WEIGHT : _____

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER _____ AIR _____

CAPACITY : TOTAL = 120.5 TAPABLE - 109.7

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE : _____

BATH DEPTH : _____

WALL LINING : _____

BURNERS : 7,200,000 BTU/hr.

PRESSURE DAMPER : _____

COMBUSTION BLOWER : _____

ACCESSORIES/ SPECIAL FEATURES : Chargewell with cover, water cooled door.

ISSUE DATE: _____

REVISION: _____

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#4 Mix	Last Rebuild 1973
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER ANACONDA		MODEL NO.	SERIAL NO.
P.O. NO.	P.O. DATE	EQUIPMENT COST 130,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 29' 4" WIDTH 13' 6" HEIGHT 9' 1"

INTERNAL DIMENSIONS : LENGTH 26' 4" WIDTH 10' 6" HEIGHT 6' 11"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 119.2 TAPABLE - 107.5

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 33" max.

WALL LINING : 85% hi alumina

BURNERS : 7,200,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES : Chargewell with cover, and water cooled door.

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#6 Mix	1979
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 110,000	INSTALLATION COST 250,000

EXTERNAL DIMENSIONS : LENGTH 29' 4" WIDTH 13' 6" HEIGHT 10'

INTERNAL DIMENSIONS : LENGTH 26' 4" WIDTH 10' 6" HEIGHT 6' 4"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 118.3 TAPABLE - 93.0

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 32"

WALL LINING : 85% hi alumina & super duty brick

BURNERS : 7,200,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES : Water cooled door, chargewell with cover.

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#3 Cost	1977
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 110,000	INSTALLATION COST 250,000

EXTERNAL DIMENSIONS : LENGTH 23' WIDTH 13' 6" HEIGHT 12'

INTERNAL DIMENSIONS : LENGTH 20' WIDTH 10' 6" HEIGHT 9' 2 3/4"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 100.4 TAPABLE - 87.4

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 41" max

WALL LINING : 85% hi alumina

BURNERS : 7,860,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES :

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#4 Cost	Last Rebuild June 1982
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 110,000	INSTALLATION COST 140,000

EXTERNAL DIMENSIONS : LENGTH 23' WIDTH 13' 6" HEIGHT 10' 8"

INTERNAL DIMENSIONS : LENGTH 20' WIDTH 10' 6" HEIGHT 7' 5"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 93.9 TAPABLE - 80.6

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 42" max

WALL LINING : 85% hi alumina & super duty

BURNERS : 7,860,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/ SPECIAL FEATURES : Water cooled door

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#6 Cost	1979
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 110,000	INSTALLATION COST 250,000

EXTERNAL DIMENSIONS : LENGTH 26' 3" WIDTH 13' 6" HEIGHT 10' 4"

INTERNAL DIMENSIONS : LENGTH 23' 3" WIDTH 10' 6" HEIGHT 7' 3"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 107.0 TAPABLE - 76.5

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 37" max

WALL LINING : 85% hi alumina & super duty

BURNERS : 7,860,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/ SPECIAL FEATURES : Water cooled door.

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#7 Cost	Last Rebuild 1970
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 130,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 23' WIDTH 13' 6" HEIGHT

INTERNAL DIMENSIONS : LENGTH 20' WIDTH 10' 6" HEIGHT

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 75 (Norm.) TAPABLE -

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH :

WALL LINING :

BURNERS : 7,860,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES : Water cooled door.

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#8 Cost	Last Rebuild 1979
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER ANACONDA		MODEL NO.	SERIAL NO.
P.O. NO.	P.O. DATE	EQUIPMENT COST 110,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 29' 6" WIDTH 13' 6" HEIGHT 9' 8"

INTERNAL DIMENSIONS : LENGTH 26' 6" WIDTH 10' 6" HEIGHT 7' 3"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 114.7 TAPABLE - 78.7

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 37" max

WALL LINING : 85% hi alumina

BURNERS : 7,860,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES : Water cooled door.

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#9 Cost	Last Rebuild 1980
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER ANACONDA		MODEL NO.	SERIAL NO.
P.O. NO.	P.O. DATE	EQUIPMENT COST 130,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 29' 6" WIDTH 13' 6" HEIGHT 9' 8"

INTERNAL DIMENSIONS : LENGTH 26' 6" WIDTH 10' 6" HEIGHT 7' 3"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instrument

UTILITIES : WATER AIR

CAPACITY : TOTAL = 114.7 TAPABLE - 78.7

PRODUCTION RATE : MELTING RATE = lbs./hr.

FURNACE TEMPERATURE :

BATH DEPTH : 37" max

WALL LINING : 85% hi alumina

BURNERS : 7,860,000 BTU/hr

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES : Water cooled door

ISSUE DATE:

REVISION:

EQUIPMENT DATA SHEET

PRIMARY - COLUMBIA FALLS

REVERB FURNACE	#1 Pig	Last Rebuild July 1980
TYPE OF EQUIPMENT	EQUIPMENT NUMBER	DATE INSTALLED

EQUIPMENT DESCRIPTION & SIZE -

MANUFACTURER		MODEL NO.	SERIAL NO.
ANACONDA			
P.O. NO.	P.O. DATE	EQUIPMENT COST 130,000	INSTALLATION COST 120,000

EXTERNAL DIMENSIONS : LENGTH 24' WIDTH 11' 3" HEIGHT 10' 5"

INTERNAL DIMENSIONS : LENGTH 21' 9" WIDTH 9' HEIGHT 6' 8"

WEIGHT :

ELECTRICAL REQUIREMENTS: VOLTS 220/440 AMPS Control & Instruments

UTILITIES : WATER AIR

CAPACITY : TOTAL = 92.8 TAPABLE - 77.8

PRODUCTION RATE : 22,000 lbs./hr. production max.

FURNACE TEMPERATURE :

BATH DEPTH : 30"

WALL LINING : Hi alumina fire brick

BURNERS : 5,000,000 BTU/hr.

PRESSURE DAMPER :

COMBUSTION BLOWER :

ACCESSORIES/
SPECIAL FEATURES :

ISSUE DATE:

REVISION:

ANODE DRY RAW MATERIALS EQUIPMENT

&

ANODE PASTE SYSTEM

ANODE DRY RAW MATERIALS

Petroleum Coke Silo 3,092 Ton Capacity

#1	Crusher, doubleroll, 12½ ton/hour
#2	Elevator, spaced bucket, 30 ton/hour capacity
#3	Vibrating Screen, single surface, ½" mesh, 25 ton/hour
#3A	Surge Hopper
#3B-1 thru 3B-4	Screw Conveyors, 4 each, 5 ton/hour capacity
#3C	Screw Conveyor, 18 ton/hour capacity
#4-1 thru 4-4	Vibrating Screen, 4 each, two surface 14/65 mesh, 6¼ ton/hour capacity
#5 & 5A	Bin, crusher feed, 2 each, 13-20 ton capacity
#6 & 6A	Volumetric Belt Feeder, 2 each, 4-12 ton/hour
#7	Crusher, doubleroll, 10 ton/hour capacity
#8	Belt Conveyor, variable speed, 10-20 ton/hour capacity
#8	Elevator, spaced bucket, 30 ton/hour capacity
#8A	Weightometer speed control
#9	Belt Conveyor, 10-20 ton/hour capacity
#9A	Electro-magnet
#9-1 & 9-2	Screw Conveyor, 2 each, 15 ton/hour capacity
#9-3 & 9-4	Rotary Vane Feeder, 2 each, 16 ton/hour capacity
#10	Screw Conveyor, 10 ton/hour capacity
#11	Storage Bin, 2 compartments, 73.6 ton capacity
#12	Screw Conveyor, 6 ton/hour capacity
#13	Magnetic Separator, 6 ton/hour capacity
#14	Elevator, spaced bucket, 6 ton/hour capacity
#15	Bin, scale feed, 19.7 ton capacity
#16	Scale, belt feed
#17-1 & 17-2	Screw Conveyor, 2 each, 8 ton/hour capacity
#17-3	Rotary Vane Feeder, 8 ton/hour capacity
#18	Screw Conveyor, 25 ton/hour capacity
#19	Storage Bin, 40 ton capacity
#20	Screw Conveyor, 5 ton/hour capacity
#21	Magnetic Separator, 4 ton/hour capacity
#22	Elevator, spaced bucket, 4 ton/hour
#23	Bin, scale feed, 20.7 ton capacity
#24	Scale, duo-screw feed
#25	Storage Bin, ball mill feed, 38 ton capacity
#26-1 & 26-2	Volumetric Belt Feeder, 2 each, variable speed, 2-6 ton/hour capacity

#27-1 & 27-2	Wind Swept Ball Mill, 2 each, 21 RPM, 5 ton/hour capacity
#28-1 & 28-2	Classifier, 2 each, gravity discharge
#29-1 & 29-2	Cyclone, 2 each
#30-1 & 30-2	Exhauster Fan, 2 each
#31	Dracco Dust Collector, 4 compartments
#32	Dracco Fan
#33-1 thru 33-4	Air Lock, 4 each, one from each Dracco unit
#34-1 & 34-2	Air Lock 2 each, one from each cyclone
#35-1 & 35-2	Screw Conveyor, 2 each, 12 ton/hour capacity
#36	Storage Bin, 4 compartments, 150 ton capacity
#37-1 thru 37-5	Rotary Vane Feeder, 5 each, from intermediate storage bins
#37-6 & 37-7	Ramsey Gate Valves
#38	Screw Conveyor, 10 ton/hour capacity
#39	Magnetic Separator, 10 ton/hour capacity
#40	Elevator, spaced bucket, 10 ton/hour capacity
#41	Bin, scale feed, 32 ton capacity
#42	Scale, duo-screw feed
#43, 43A, & 43B	Scale Discharge Hopper, 3 each
#44, 44A, & 44B	Rotary Vane Feeder, 3 each, one from each scale hopper
#45-1 thru 45-4	Screw Conveyor, 4 each, 15 ton/hour capacity
#46-1 thru 46-3	Screw Conveyor, 3 each, 15 ton/hour capacity
#160	Anode Dust Control
#161	Fan, dust control
#162	Screw Conveyor

ANODE PASTE SYSTEM

#50	Mixers, 5 each, 4.2-4.5 tons, 75 H.P. 900 RPM (Hot Oil) for higher temperature, Baker Perkins, Signa Blade, Lower 0 20.2 rpm, Upper - 11.9 rpm
#49	Extruder Hoppers, 5 each, 4.5 ton capacity
#52	Extruders, 5 each
#53	Extruder Conveyors, 5 each
#54	Belt Conveyor
#55	Continuous Bucket Elevator
#55A	Continuous Bucket Elevator
#56	Belt Conveyor
#57	Bucket Elevator
#57-1	Belt Conveyor
#57-2	Belt Conveyor
#84-1	Briquette Pit Sump Pump
#84-2	Briquette Pit Sump Pump
	Water Recirculating Pump

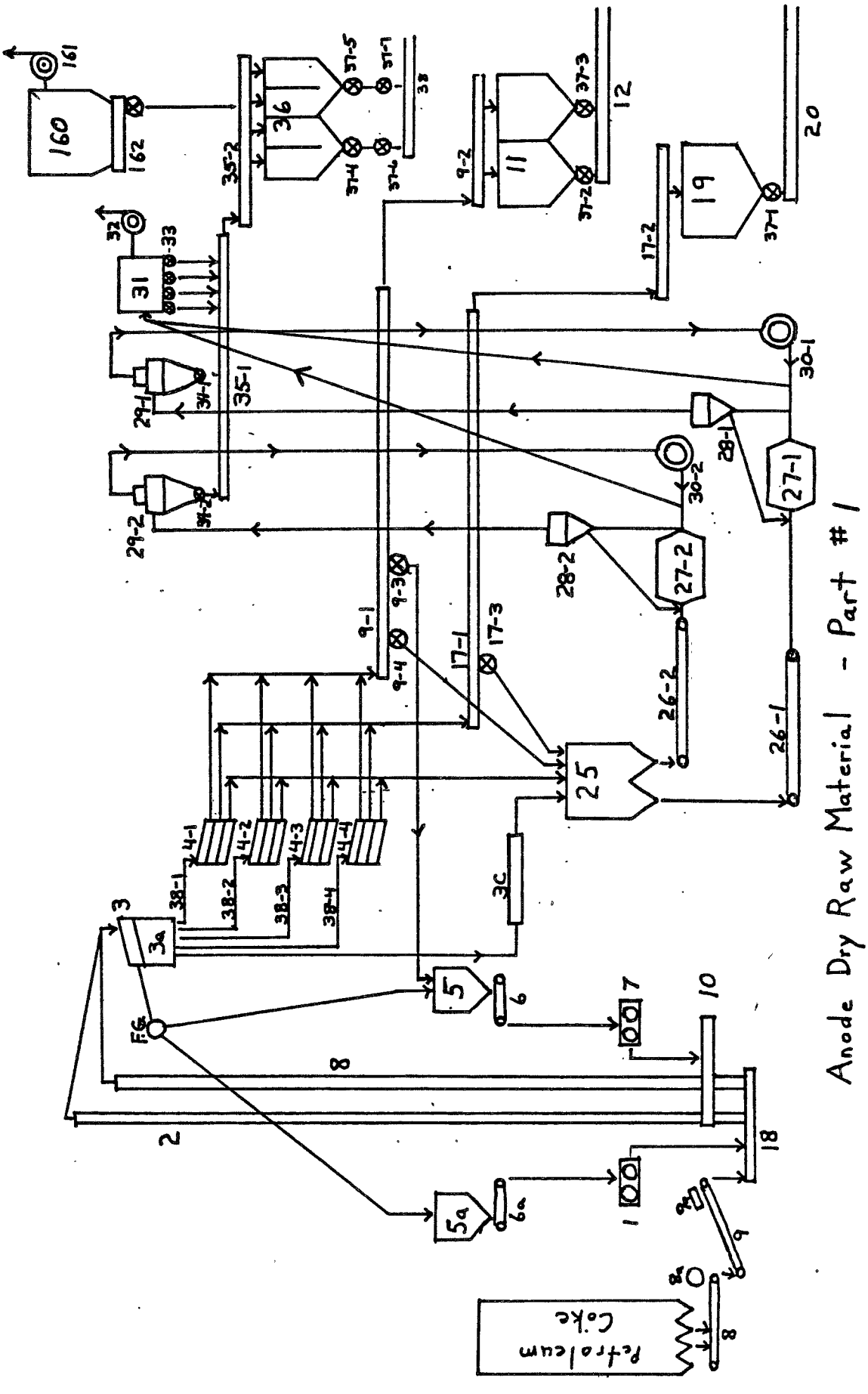
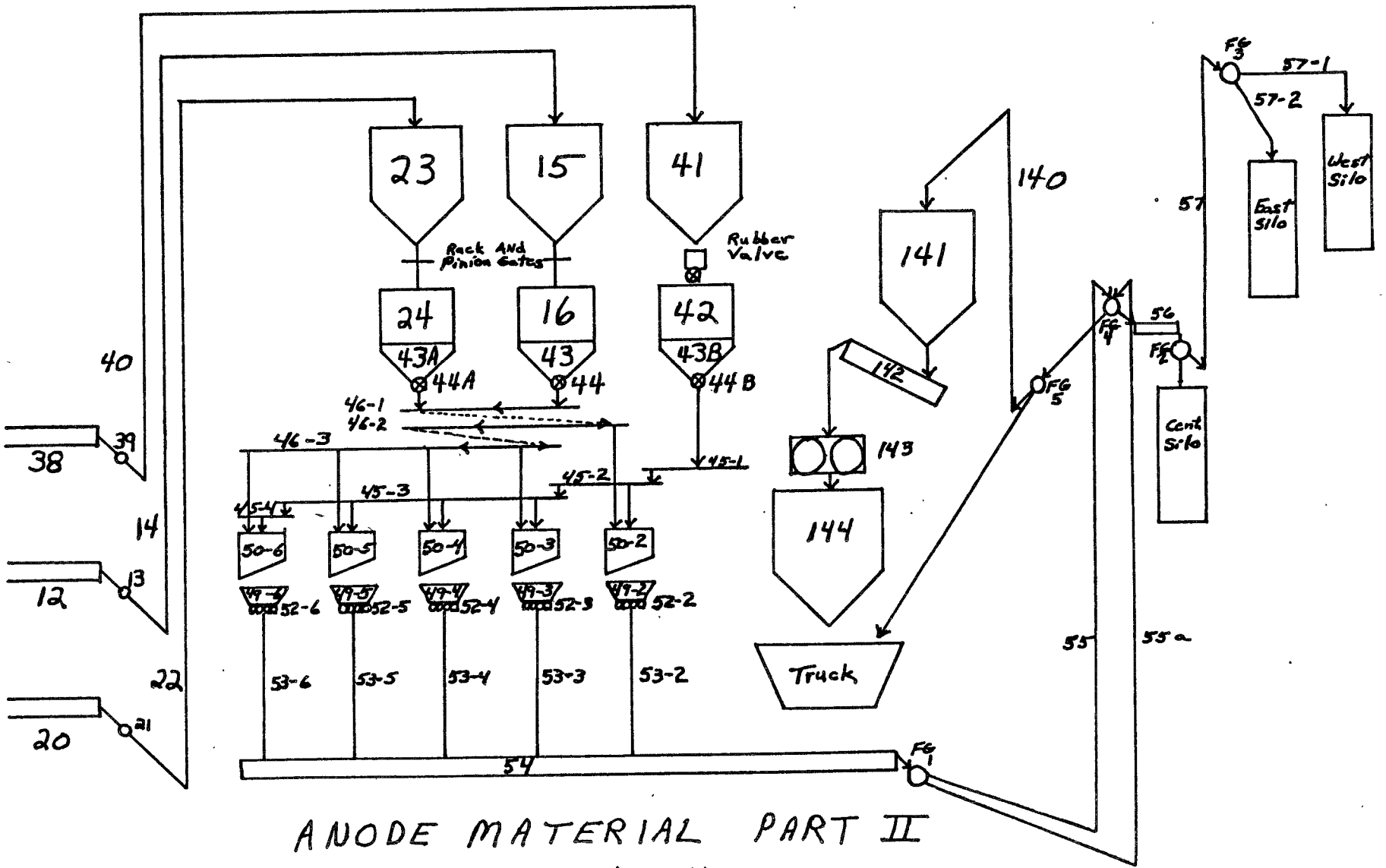


Figure 1



ANODE MATERIAL PART II

Figure 1A.

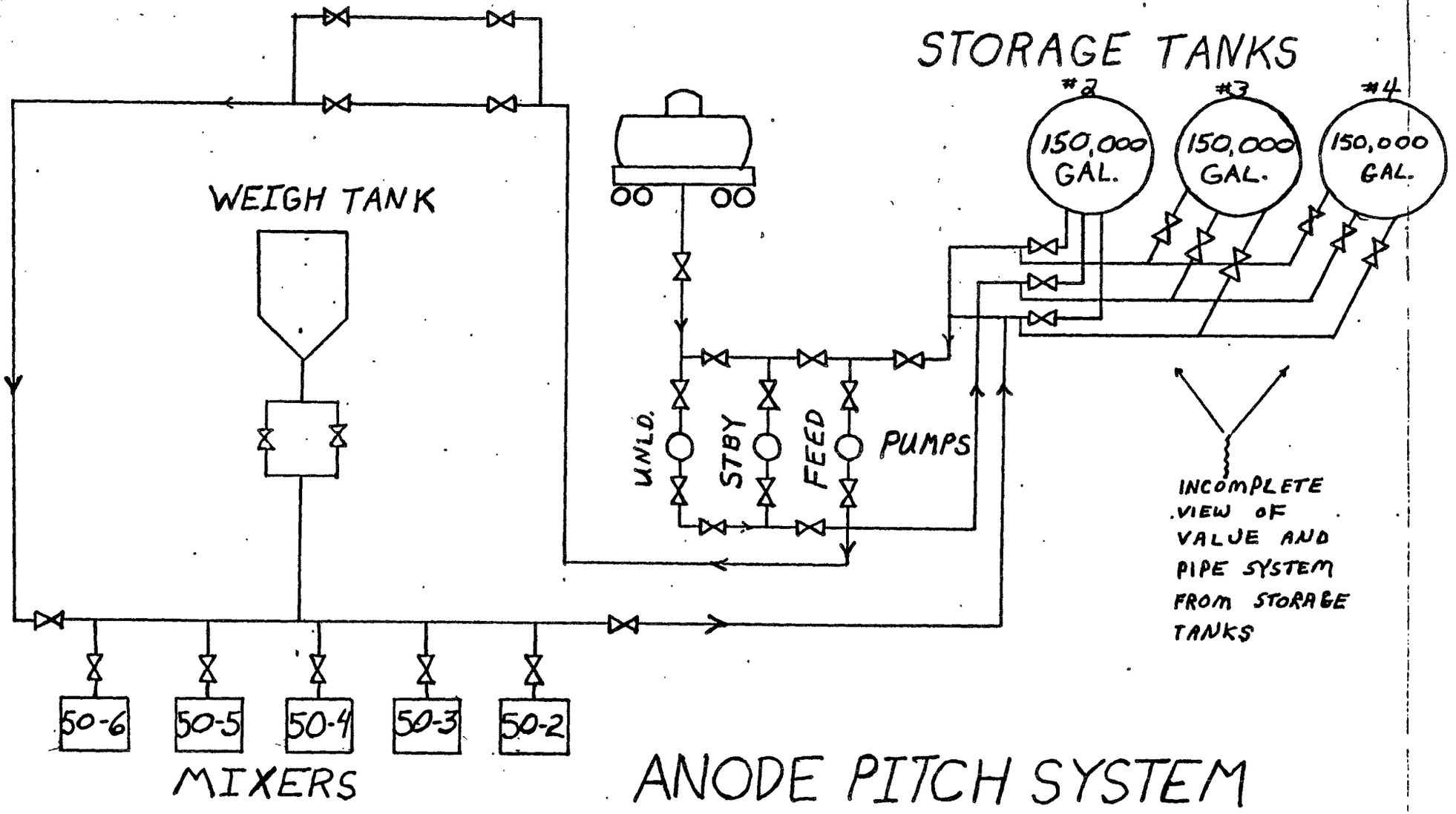


Figure 2

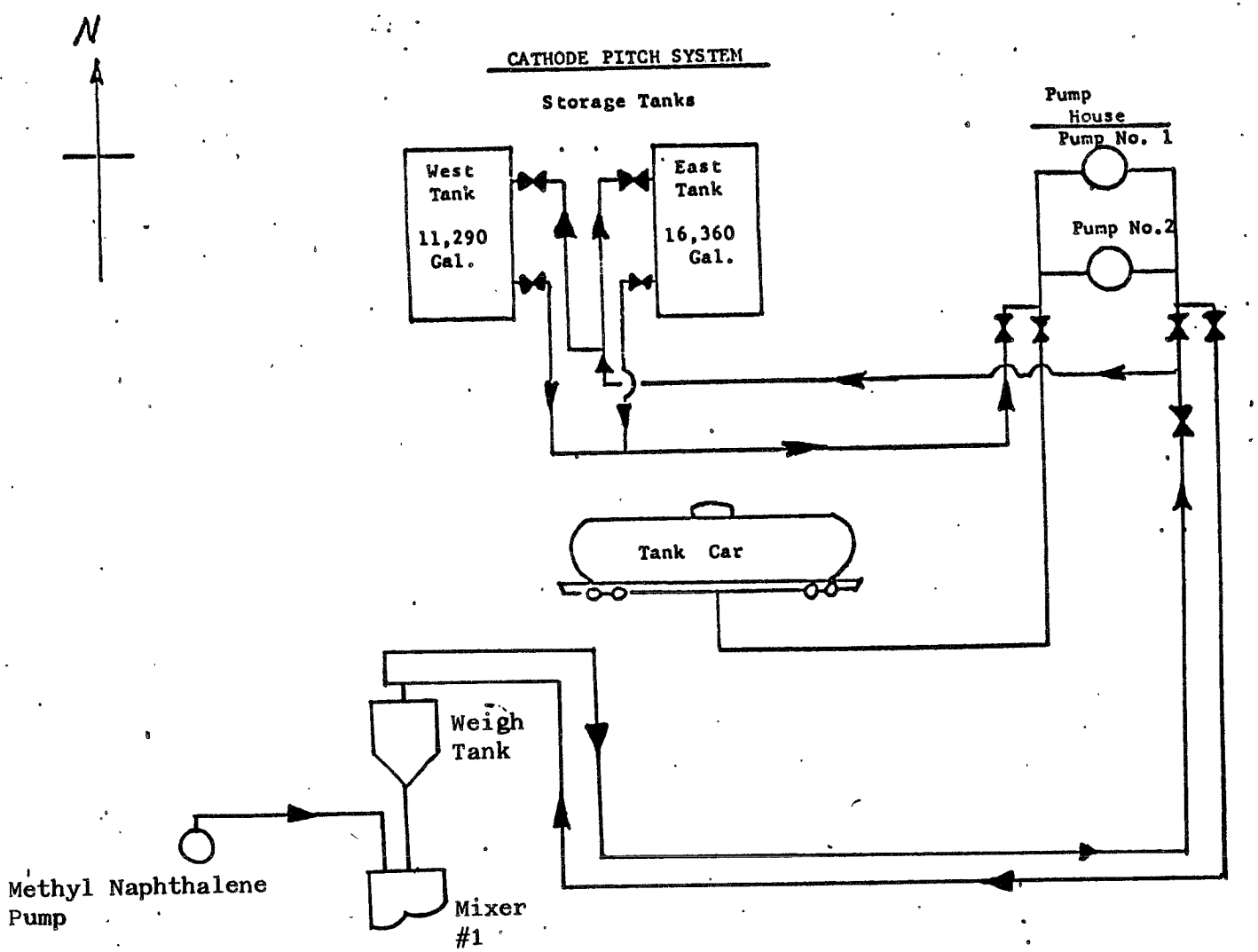
CATHODE DRY RAW MATERIALS

CATHODE DRY RAW MATERIALS

#2	Flop Gate
#3	Flop Gate
#4	Flop Gate
#5	Flop Gate
#6	Belt Conveyor - 10 T/hr - variable speed
#7	Belt Conveyor - 10 T/hr
#7a	Electro-Magnet
#7b	Screen
#50-1	Cathode Paste Mixer - 4.2-4.5 Ton
#61	Elevator, spaced bucket, 10 T/hr
#62	Anthracite Coal Hopper, dryer feed, 25 Ton
#63	Disc Feeder, adjustable, 2-5 T/hr
#64	Dryer, parallel flow, 5 T/hr
#64a	Dryer, dust control cyclone
#64b	Cyclone Exhaust Fan
#65	Elevator, spaced bucket, 10 T/hr
#66	Screen, two surface, vibrating ¼" 20 mesh, 10 T/hr
#67	Anthracite Coal Hopper, rod mill feed, 25 Ton
#68	Belt Feeder, 2-6 T/hr
#69	Rod Mill, 5 T/hr
#72	Screw Conveyor, 10", 6 T/hr
#73-1 thru #73-4	Screw Conveyor, 10", 6 T/hr
#74	Milled Anthracite Coal Storage Bin, three compartments, 60 Tons total
#75-1 thru #75-3	Rotary Vane Feeder, 6 T/hr
#76	Screw Conveyor
#76a	Magnetic Separator
#77	Elevator, spaced bucket, 6 T/hr
#78	Scale Feed Hopper, 25 Ton
#79	Scale, Duo Screw w/rotary valve
#80	Scale Feed Hopper, 50 Ton
#81	Scale Discharge Hopper, 3 Ton
#81a	Scale Discharge Hopper, 3 Ton
#81-b-1	Rotary Vane Feeder
#81-b-2	Rotary Vane Feeder
#82	Screw Conveyor, 12", 6 T/hr
#82a	Screw Conveyor, 10", 3 T/hr
#120	Fan
#120a	Cathode Dust Control

#121	Screw Conveyor
#121a	Rotary Vane Feeders, 3 each
#122	Screw Conveyor
#123	Fan
#124	Screw Conveyor
#125	Screw Conveyor
#126	Graphite Scale Feed Hopper
#127	Screw Conveyor, 4", scale feed
#128	Screw Conveyor, 9", scale feed
#129	Screw Conveyor, 4", scale feed
#130	Screw Conveyor, 6", scale feed
#131	Anthracite Coal Dust, scale feed hopper
#132	Scale, graphite and dust
#132a	Keystone Gate
#132b	Keystone Gate
#5	Vibrating Screen 1 surface ¼" mesh

FIGURE 6



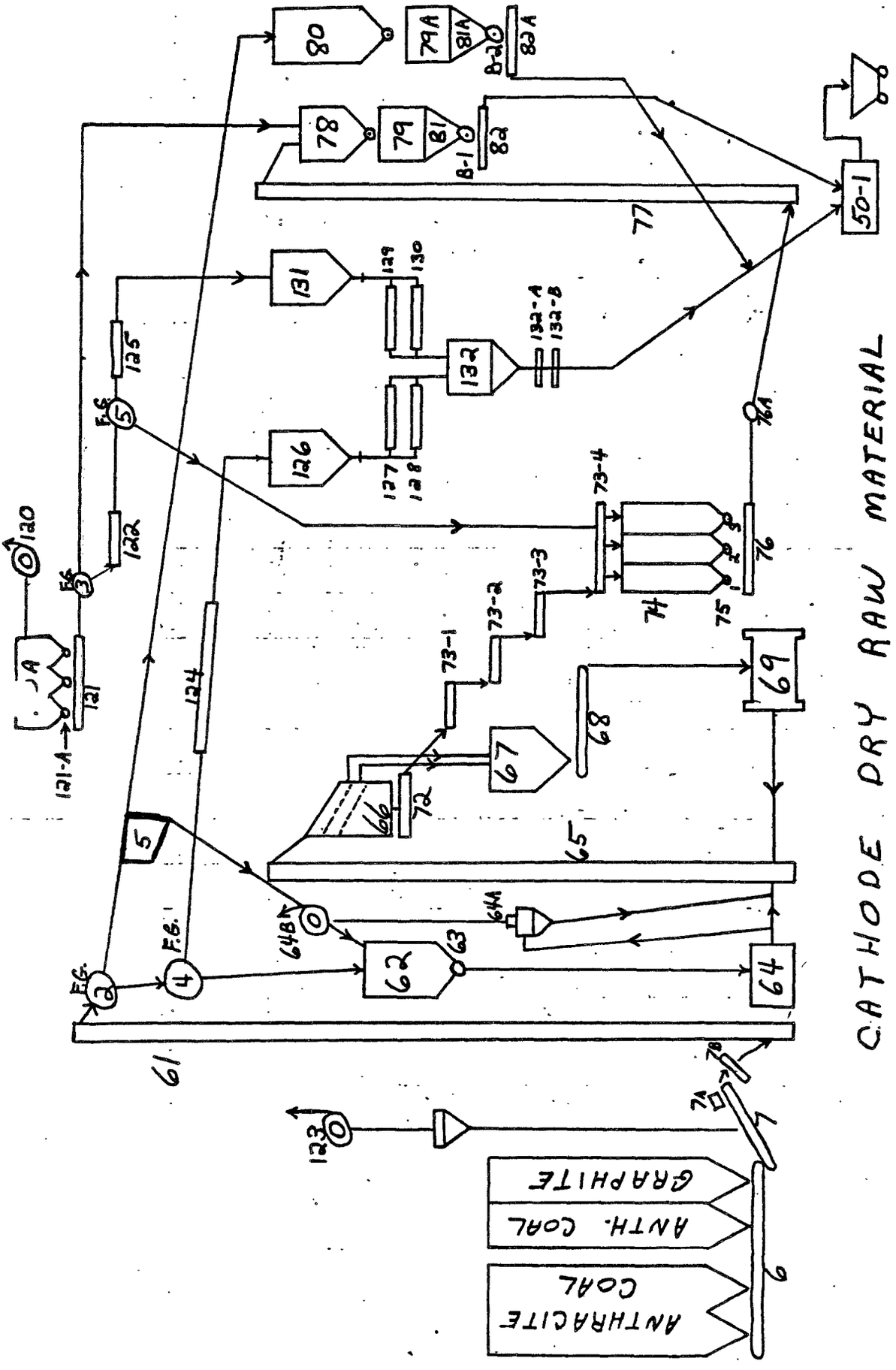


Figure 7

MELTING & CASTING EQUIPMENT

MELTING AND CASTING EQUIPMENT

FURNACE	#1 PIG	#2 PIG	#3 MIX	#3 CAST	#4 MIX	#4 CAST	#6 MIX	#6 CAST	#7 CAST	#8 CAST	#9 CAS
* TOTAL CAPACITY	86.6	92.8	120.5	100.4	119.2	93.9	118.3	107.0	75 NOM.	114.7	114.7
* TAPABLE	72.0	77.8	109.7	87.0	107.5	80.6	93.0	76.5		78.7	78.7
TYPE	REVERB----------										-REVERB
DESIGNER (ALL ANACONDA)	J.C. OLSON R.A. NOCK	J.C. OLSON	J.C. OLSON	R.A. NOCK	R.A. NOCK	R.A. NOCK	R.A. NOCK	R.A. NOCK	GORTON	J. HART	J. HART
SPECIAL FEATURES	Z Blok roof	Chargewell	Chargewell w/cover		Chargewell w/cover		Chargewell w/cover				
	Chargewell w/cover										
DOORS	Refractory	Refractory	Water Cooled	Refractory	Water Cooled	Water Cooled	Water Cooled	Water Cooled	Water Cooled	Water Cooled	Water Cooled
** BURNER CAPACITY	7,200	5,000	7,200	7,860	7,200	7,860	7,200	7,860	7,860	7,860	7,860
STATIONS				No. 3		No. 4		No. 6		No. 8 and No. 9	
FILTER				Union Carbide		Union Carbide		Union Carbide	B.A.	Union Carbide	B.A.
***HYDRAULIC CYLINDER CAPACITY				117,810#		117,810#		117,810#	117,810#	169,646# (one station)	
HYDRAULIC CYLINDER STROKE				218 & 240"		218 & 240"		218 & 240"	218 & 240"	258"	
HYDRAULIC CYLINDER DIAMETER				10"		10"		10"	10"	12"	
CASTING MACHINE DESIGNER				R.A. NOCK Anaconda		R.A. NOCK Anaconda		R.A. NOCK Anaconda	J.C. OLSON Anaconda	LOMA	

PIG CASTER	M.H. Treadwell Co. Manufacturer	Capacity
SIZE PIG	30# and 50#	Tons per hour at maximum speed speed 5.5 feet per minute — 11 ton estimate

NOTES: Chargewell cover contain Z Blok

* Thousand pounds

** Thousand BTU/hour

*** @ 1500 PSI on Cylinder (includes crosshead)

Casting cylinders manufactured by:

Vickers, Sawyer & Remco Manufacturing
(see Drawing J-1230)

ROLLING STOCK

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
01 32002	2	1982 Pontiac	Plant Manager
32005	5	1979 Chev Station Wagon	Guards
32006	6	1980 Jeep Wagoneer	Guards
32007	7	1981 Jeep Wagoneer	Laboratory
32010	10	1975 Dodge Van Ambulance	Guards
32021	21	1978 Ford Van	Guards
32022	22	1979 Pickup	Warehouse
32023	23	1982 GMC Van	Warehouse
32026	26	1979 Chev. Pickup	Laboratory
32028	28	1978 Toyota Pickup	Carpenter/Paint
32029	29	1982 GMC Pickup	Power and Utilities
32030	30	1982 GMC Pickup	F.M.-Casting
32033	33	1980 Dodge Pickup	Service
32034	34	1980 Chev. Pickup	Service
32035	35	1982 GMC Pickup	Service
32036	36	1982 GMC Pickup	Service
32042	42	1967 Chev. Pickup	F.M.-Spec. Proj.
32043	43	1982 GMC Pickup	Guards
32044	44	1970 Chev. Blazer	Main Office-Edith
32047	47	1981 Chev. Pickup	Service
32050	50	1973 Ford Courier Pickup	Construction
32051	51	1974 Ford Courier Pickup	Construction
32052	52	1971 Datsun Pickup	Construction
32053	53	1973 Datsun Pickup	Construction
32054	54	1973 Mazda Pickup	F.M. - North Area
32055	55	1973 Datsun Pickup	Construction
32057	57	1971 Toyota Pickup	Construction
32058	58	1974 Toyota Pickup	F.M. - Rebuild Bus
32059	59	1973 Chev. Luv Pickup	F.M. - Prev. Maint.
32065	65	1972 Ultra Vac 800	Service
32075	75	1953 Inter'l Fire Truck	Guards
32077	77	1973 Ford F-350 Ranger	Construction
32079	79	1980 2000# Flatbed Dump Truck	Service
32080	80	1967 Inter'l Flatbed	Service
32081	81	1980 Flatbed Dump GMC	Service
32085	85	1981 GMC Dump	Service
32086	86	1981 GMC Dump	Service
32087	87	1982 GMC Dump	Service

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32089	89	1977 Ford Garbage Truck	Service
32093	93	1968 GMC Hot Metal Tractor	Casting
32094	94	1968 GMC Hot Metal Tractor	Casting
32095	95	1980 Champion Tractor	Rod Mill
32110	110	1976 Cushman M-M (out of service)	Line 1
32111	111	1976 Cushman M-M	Line 2
32112	112	1976 Cushman M-M	Line 3
32113	113	1977 Cushman M-M	Line 4
32114	114	1977 Cushman M-M	Line 5
32115	115	1978 Cushman Exec.	Pot Reline-Hedstrom
32119	119	1976 Cushman Exec.	Potlines-Red. Eng.
32120	120	1977 Cushman Exec.	L-1 Control-Green
32121	121	1977 Cushman Exec.	Paste Plant
32122	122	1977 Cushman Exec.	Line 1-Spare
32123	123	1979 Cushman Exec.	F.M. - Shop
32124	124	1979 Cushman Exec.	Line 1-Spare
32125	125	1978 Cushman Exec.	F.M. - ABCD Shifts
32126	126	1980 Cushman Exec.	Line 5
32127	127	1978 Cushman Exec.	Fab Shop
32128	128	1977 Cushman Exec.	L-4 Control-Ranes
32131	131	1980 Cushman Exec.	Construction
32133	133	1980 Cushman Exec.	Construction
32134	134	1979 Cushman Exec.	F.M. - Spec. Proj.
32135	135	1978 Cushman Exec.	F.M. - North Area
32137	137	1976 Cushman Exec.	Rectifier
32138	138	1980 Cushman Exec.	F.M. - E. Plant
32141	141	1979 Cushman Exec.	F.M. - Planners
32142	142	1979 Cushman Exec.	Warehouse
32144	144	1979 Cushman Exec.	F.M. - Casting
32145	145	1979 Cushman Exec.	Line 1-Spare
32146	146	1978 Cushman Exec.	F.M. - Casting
32148	148	1976 Cushman Exec.	Potlines-Red. Eng.
32149	149	1979 Cushman Exec.	F.M. - Shops
32150	150	1980 Cushman Exec.	Carpenter/Paint
32151	151	1978 Cushman Exec.	F.M. - W. Plant
32152	152	1978 Cushman Exec.	Power & Util. (M&I)
32153	153	1976 Cushman Exec.	F.M. - Masons
32154	154	1976 Cushman Exec.	Anode Repair-Hedstrom

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32157	157	1980 Cushman Exec.	F.M. - Shops
32162	162	1970 Cushman Exec.	F.M. - North Area
32163	163	1980 Cushman Exec.	F.M. - Cranes
32164	164	1978 Cushman Exec.	Env. Control-Darling
32165	165	1980 Cushman Exec.	Pot Reline-Hedstrom
32166	166	1974 Cushman Exec.	Casting
32167	167	1979 Cushman Exec.	F.M. - E. Plant
32168	168	1979 Cushman Exec.	F.M. - Pot Rebuild
32169	169	1979 Cushman Exec.	Laboratory
32175	175	1981 Cushman Exec.	Laboratory
32199	199	1980 Kalamazoo	F.M. - North Area
32200	200	1980 Kalamazoo	F.M. - Masons
32202	202	1977 Kalamazoo	F.M. - W. Plant
32203	203	1980 Kalamazoo	F.M. - Spec. Proj.
32209	209	1977 Kalamazoo	F.M. - Masons
32210	210	1980 Kalamazoo	F.M. - W. Plant
32211	211	1979 Kalamazoo	F.M. - W. Plant
32212	212	1980 Kalamazoo	F.M. - Masons
32213	213	1980 Kalamazoo	F.M. - Spec. Proj.
32214	214	1977 Kalamazoo	F.M. - W. Plant
32215	215	1977 Kalamazoo	F.M. - Pot Rebuild
32216	216	1980 Kalamazoo	F.M. - Cranes
32218	218	1979 Kalamazoo	F.M. - Shops
32220	220	1977 Kalamazoo	F.M. - E. Plant
32221	221	1974 Westinghouse	F.M. - Casting
32223	223	1970 Kalamazoo	F.M. - Planners
32224	224	1978 Kalamazoo	F.M. - Pot Rebuild
32225	225	1974 Kalamazoo	F.M. - Planners
32226	226	1974 Kalamazoo	F.M. - Casting
32227	227	1974 Kalamazoo	F.M. - Masons
32228	228	1974 Kalamazoo	F.M. - E. Plant
32229	229	1974 Kalamazoo	F.M. North Area
32230	230	1977 Kalamazoo	F.M. - E. Plant
32231	231	1981 Kalamazoo	F.M. - W. Plant
32232	232	1980 Kalamazoo	L-3 Control-Danford
32233	233	1980 Kalamazoo	F.M. - ABCD Shifts
32236	236	1978 Kalamazoo	F.M. - Prev. Maint.
32237	237	1978 Kalamazoo	F.M. - E. Plant
32238	238	1978 Kalamazoo	L-5 Control-Lester

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32239	239	1978 Kalamazoo	Carpenter/Paint
32240	240	1981 Kalamazoo	F.M. - Spec. Proj.
32241	241	1981 Kalamazoo	F.M. - Prev. Maint.
32242	242	1981 Kalamazoo	F.M. - Spec. Proj.
32243	243	1978 Kalamazoo	Carpenter/Paint
32244	244	1979 Kalamazoo	F.M. - E. Plant
32245	245	1973 Kalamazoo	L-4 Control-Ranes
32247	247	1980 Kalamazoo	Construction
32248	248	1978 Kalamazoo	F.M. - Garage
32249	249	1978 Kalamazoo	F.M. - Casting
32250	250	1980 Kalamazoo	F.M. - ABCD Shifts
32251	251	1980 Kalamazoo	F.M. - ABCD Shifts
32252	252	1978 Cushman Titan	Potlines-Red. Eng.
32253	253	1978 Cushman Haulster	F.M. - Prev. Maint.
32258	258	1976 Cushman Truckster	F.M. - Garage
32259	259	1977 Cushman Truckster	F.M. - Masons
32260	260	1980 Kalamazoo	F.M. - ABCD Shifts
32261	261	1968 Cushman Truckster	F.M. - Planners
32267	267	1977 Cushman Truckster	L-1Control-Green-Spare
32268	268	1979 Cushman Truckster	Potlines-Red. Eng.
32269	269	1979 Cushman Truckster	F.M. - Cranes
32272	272	1977 Cushman Truckster	Guards
32273	273	1977 Cushman Truckster	L-3 Control-Danford
32275	275	1978 Cushman Haulster	Computer Rm-Prestbye
32276	276	1967 Cushman	Laboratory
32277	277	1978 Cushman Titan	Laboratory
32278	278	1980 Kalamazoo	L-2 Control-Conrad
32280	280	1982 Cushman Truckster	Carpenter/Paint
32282	282	1976 Cushman Titan	L-2 Control-Conrad
32283	283	1980 Cushman Truckster	Carpenter/Paint
32284	284	1980 Cushman Truckster	Carpenter/Paint
32285	285	1980 Cushman Haulster	F.M. - Prev. Maint.
32286	286	1980 Cushman Flatbed (out of service)	L-1 Control-Green
32287	287	1980 Cushman Flatbed	F.M. - Shops
32288	288	1980 Cushman Flatbed	F.M. - E. Plant
32289	289	1980 Cushman Flatbed	F.M. - ABCD Shifts
32290	290	1980 Cushman Flatbed	F.M. - ABCD Shifts

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32292	292	1974 Kalamazoo	F.M. - Casting
32293	293	1974 Kalamazoo	F.M. - Spec. Proj.
32294	294	1974 Kalamazoo	F.M. - W. Plant
32299	299	1979 Kalamazoo Dump Truck	Env. Control-Darling
32301	301	1969 Tennant Sweeper	Fab/Machine Shop
32302	302	1979 Tennant Sweeper	F.M. - Shops
32303	303	1980 Tennant Sweeper	
32304	304	1981 Tennant Floor Scrubber	Warehouse
32308	308	1979 Tennant Sweeper-Spare	Line 3-Spare
32311	311	1981 Tennant Sweeper	Line 3
32312	312	1982 Tennant Sweeper	Line 5
32313	313	1980 Tennant Sweeper (out of service)	Line 1
32315	315	1980 Tennant Sweeper	Line 2
32316	316	1982 Tennant Sweeper	Line 4
32317	317	1982 Tennant Sweeper	Casting
32326	326	1978 Tennant Sweeper	Service
32332	332	1980 Ultra Vac	Env. Control-Darling
32333	333	1980 Ultra Vac	Paste Plant
32334	334	1980 Ultra Vac	F.M. - Pot Rebuild
32335	335	1980 Ultra Vac	F.M. - Garage
32336	336	1981 Ultra Vac	Env. Control-Darling
32337	337	1981 Ultra Vac	Pot Reline-Hedstrom
32347	347	1980 Waldon Payloader	Line 4
32348	348	1980 Waldon Payloader	Line 5-Spare
32349	349	1980 Waldon Payloader	Line 1-Spare
32350	350	1977 Hough Payloader	F.M.-Anode Repair
32351	351	1979 Waldon	Line 3
32353	353	1979 Waldon Front End Loader (out of service)	Line 1
32354	354	1980 Waldon Front End Loader	Line 2
32355	355	1980 Waldon Loader	Env. Control-Darling
32356	356	1980 Waldon Loader	F.M. - Masons
32357	357	1980 Waldon Loader	Line 5
32360	360	1969 Hough Payloader	F.M. - Anode Repair
32362	362	1970 Hough Payloader	L-3 Control-Danford
32363	363	1975 Hough Payloader	L-1Control-Green-Spare
32364	364	1975 Hough Payloader	Line 4-Spare
32366	366	1960 Hough Payloader-Skirts	L-2 Control-Conrad

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32369	369	1982 Bobcat	Service
32370	370	1980 Bobcat Front End Loader	Pot Reline-Hedstrom
32371	371	1978 Hough Payloader (out of service)	L-1 Control-Green
32372	372	1978 Hough Payloader	Line 3
32373	373	1978 Hough Payloader	Line 4-Spare
32374	374	1978 Hough Payloader	L-2 Control-Conrad
32375	375	1978 Hough Payloader	L-5 Control-Lester
32376	376	1978 Hough Payloader	L-4 Control-Ranes
32377	377	1980 Bobcat	Service
32379	379	1977 Bobcat Loader	Service
32380	380	1980 Bobcat Loader	Service
32381	381	1979 Michigan Loader	Service
32382	382	1979 Bobcat Loader	Service
32383	383	1977 Cat Loader - Rental	Service
32384	384	1974 Cat Loader	Service
32385	385	1976 A/C Loader Fiat-Allis	Service
32386	386	1977 Case Loader	Service
32387	387	1981 Bobcat Loader	Service
32388	388	1982 Bobcat Loader	Service
32402	402	1981 Clark Forklift	Warehouse
32403	403	1979 Clark Forklift	Warehouse
32404	404	1978 A/C 2000# Highlift	F.M. - Garage
32405	405	1967 Yale 2000# Highlift	F.M. - Planners
32406	406	1980 Cat. Elect. Highlift	F.M. - ABCD Shifts
32407	407	1980 Cat. Elect. Highlift	F.M. - Planners
32408	408	1980 Cat. Elect. Highlift	F.M. - W. Plant
32409	409	1980 Cat. Elect. Highlift	(out of service)
32410	410	1979 Clark 4000# F. Truck	(returned)
32411	411	1976 Yale 6000# F. Truck	Casting
32412	412	1980 Cat. Elect. Highlift	F.M. - Planners
32413	413	1980 Cat. Elect. F. Truck	Casting
32415	415	1976 Yale 6000# F. Truck	Line 1-Spare
32416	416	1977 Yale 6000# F. Truck	Line 1-Spare
32417	417	1977 Yale 6000# F. Truck	Line 4-Spare
32418	418	1980 Cat. Elect. Highlift	F.M. - Planners
32422	422	1971 Lancer 7000# Side Shift	
32424	424	1980 A/C 7000# Lancer Side Shift	Line 2-Spare

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32425	425	1978 A/C 4000# F. Truck	F.M. - Planners
32426	426	1980 Lancer 7000# Side Shift	Line 2-Spare
32427	427	1980 Lancer Sidelift	Line 2-Spare
32430	430	1980 Cat Forklift M80	Casting
32431	431	1980 Cat Forklift M80	Casting
32432	432	1980 Cat Forklift M80	Casting
32433	433	1980 Cat Forklift M80	Pot Reline-Hedstrom
32434	434	1980 Cat Forklift M80	F.M. - Pot Rebuild
32436	436	1978 Cat 8000# F. Truck	F.M. - Masons
32437	437	1980 Cat 8000# F. Truck	Anode Repair-Hedstrom
32438	438	1979 Cat 8000# F. Truck	Casting
32439	439	1979 Cat 8000# F. Truck	Env. Control-Darling
32441	441	1980 Cat 8000# F. Truck	Casting
32442	442	1980 Cat 8000# F. Truck	Pot Reline-Hedstrom
32443	443	1974 Yale 6000# F. Truck	Line 5-Spare
32444	444	1974 Yale 6000# F. Truck	Line 5
32445	445	1978 Yale 6000# F. Truck	L-4 Control-Ranes
32448	448	1970 Yale 6000# F. Truck	L-2 Control-Conrad
32449	449	1973 Yale 6000# F. Truck	L-5 Control-Lester
32450	450	1978 Yale 6000# F. Truck	Casting
32451	451	1980 Cat 8000# F. Truck	F.M. - Planners
32453	453	1970 Yale 6000# F. Truck	Casting
32455	455	1973 Yale 6000# F. Truck	Casting
32457	457	1980 Hyster 5550# F. Truck	Warehouse
32458	458	1977 A/C 6000# F. Truck	L-3 Control-Danford
32459	459	1977 A/C 8000# F. Truck	Env. Control-Darling
32460	460	1980 Cat. Elect. 8000# F. Truck	Line 1 (out of serv)
32462	462	1972 A/C 8000# F. Truck-Slabs	Anode Repair-Hedstrom
32463	463	1973 A/C 6000# F. Truck	Line 4-Spare
32464	464	1977 A/C 8000# F. Truck	F.M. - Anode Repair
32465	465	1978 A/C 8000# F. Truck	Line 5
32466	466	1979 Clark 8000# F. Truck	Service
32467	467	1979 Clark 8000# F. Truck	Fab Shop
32468	468	1980 M80 Cat Elect. F. Truck	Pot Reline-Hedstrom
32471	471	1978 A/C 8000# F. Truck (out of service)	Line 1
32472	472	1980 Cat Elect. 8000# F. Truck	Line 3

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32474	474	1970 Yale 8000# F. Truck	Line 3
32475	475	1977 Yale 8000# F. Truck	Line 2
32476	476	1978 Yale 8000# F. Truck	Line 5-Spare
32477	477	1978 Yale 8000# F. Truck	Line 4
32478	478	1978 A/C 8000# F. Truck	F.M. - Prev. Maint.
32479	479	1979 Cat 8000# F. Truck	Line 4
32480	480	1977 Hyster 11000# F. Truck	Pot Reline-Hedstrom
32481	481	1979 Cat 8000# F. Truck	Line 2
32482	482	1977 Yale 10000# F. Truck	Casting
32483	483	1978 A/C 8000# F. Truck	F.M. - Pot Rebuild
32490	490	1981 Hyster	Service
32491	491	1980 Hyster Challenger	Service
32492	492	1980 EP 12000# F. Truck-Tapping Trk.	Line 5
32495	495	1955 EP 12000# F. Truck-Tapping Trk.	Line 4-Spare
32496	496	1981 EP 12000# F. Truck-Tapping Trk.	Line 3
32497	497	1980 EP 12000# F. Truck	Line 2
32498	498	1980 EP 12000# F. Truck (out of service)	Line 1
32501	501	1969 Yale 12000# F. Truck	Line 3-Spare
32502	502	1969 Yale 12000# F. Truck-Tapping	Line 4
32505	505	1980 Hyster 15000# F. Truck	Casting
32506	506	1977 Hyster 22500# F. Truck	Casting
32507	507	1978 Clark 30000# F. Truck	Casting
32508	508	1974 Yale 15000# F. Truck	Pot Reline-Hedstrom
32509	509	1965 Yale 15000# F. Truck	Casting
32510	510	1968 Yale 15000# F. Truck	Line 4-Hot Metal Transfer
32511	511	1968 Yale 15000# F. Truck	Line 5-Hot Metal Transfer
32512	512	1968 Yale 15000# F. Truck	Line 3-Hot Metal Transfer
32513	513	1968 Yale 15000# F. Truck	Line 4-Spare
32514	514	1969 Yale 15000# F. Truck	Line 2-Hot Metal Transfer
32515	515	1969 Yale 15000# F. Truck (out of service)	Line 1-Hot Metal Transfer

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32516	516	1979 Eric F. Truck	Line 3-Spare
32517	517	1979 Eric F. Truck	Line 3-Spare
32525	525	1967 Ore Truck	Line 2
32526	526	1957 Ore Truck	Line 4
32529	529	1968 Ore Truck - Spare	Line 1
32531	531	1969 Ore Truck - Spare	Line 5
32532	532	1969 Ore Truck	Line 3
32533	533	1974 Ore Truck	Line 1
32534	534	1980 Ore Truck	Line 1
32535	535	1980 Ore Truck (out of service)	Line 1
32536	536	1981 Ore Truck	Line 5
32537	537	1981 Ore Truck	Line 4-Spare
32538	538	1981 Ore Truck	Line 3
32539	539	1981 Ore Truck	Line 2
32540	540	1970 Drott Carry Deck	Line 2-Spare
32541	541	1977 Drott Carry Deck	Line 2-Spare
32542	542	1981 Ore Truck	Line 4-Spare
32543	543	1982 Ore Truck	Line 2-Spare
32544	544	1981 Ore Truck	Line 5-Spare
32550	550	1955 Yale Towne	Env. Control-Darling
32553	553	1980 Manlift	F.M. - Planners
32554	554	1955 Yale Plat. Truck	F.M. - Planners
32555	555	1980 M100 Dogging Cart	Line 3
32556	556	1980 M100 Dogging Cart (out of service)	Line 1
32557	557	1980 M100 Dogging Cart	Line 5
32558	558	1980 M100 Dogging Cart	Line 4
32560	560	1955 EP Plat. Truck	Env. Control-Darling
32561	561	1955 Elpar Plat. Truck	Env. Control-Darling
32564	564	1979 Cat. El. F. Truck-Dogging Cart	Line 3-Spare
32565	565	1979 Cat. El. F. Truck-Dogging Cart	Line 2
32569	569	1955 Elpar Plat. Truck-Paste Charger	Line 5-Spare
32570	570	1955 Elpar Plat. Truck-Paste Charger	Line 5-Spare

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32571	571	1970 AAC Big Joe	Line 2-Spare
32572	572	1973 AAC Big Joe	Line 3-Spare
32573	573	1968 Elwell Parker Briquette Truck	Line 3
32574	574	1981 Briquette Truck	Line 3-Spare
32601	601	1960 Ready Power	Service
32602	602	1959 Ready Power	Potlines
32625	625	Joy Compressor	Carpenter/Paint
32627	627	Worthington Compressor	Service
32629	629	Gardner Denver Compressor	Service
32631	631	Joy Compressor	Service
32635	635	Joy Compressor	F.M. - Boiler House
32636	636	Joy Compressor	F.M. - Boiler House
32637	637	Joy Compressor	F.M. - Boiler House
32638	638	Joy Compressor	F.M. - Boiler House
32639	639	Joy Compressor	F.M. - Boiler House
32640	640	Joy Compressor	F.M. - Boiler House
32641	641	Joy Compressor	F.M. - Boiler House
32642	642	1978 Worthington Compressor	F.M. - Pot Rebuild
32643	643	Elliott Compressor #8	F.M. - Boiler House
32644	644	Elliott Compressor #8	F.M. - Boiler House
32650	650	Essicks Mixer	F.M. - Masons
32652	652	Essicks Mixer	F.M. - Masons
32653	653	Essicks Plaster Mixer	F.M. - Masons
32654	654	Essicks Plaster Mixer	F.M. - Masons
32655	655	Essicks Plaster Mixer	F.M. - Masons
32656	656	Muller Mixer	F.M. - Masons
32657	657	Muller Mixer	F.M. - Masons
32658	658	Douglas Cement Mixer	F.M. - Masons
32659	659	Essicks Cement Mixer	F.M. - Masons
32660	660	1981 Essicks Cement Mixer	F.M. - Masons
32661	661	Thor Trowel	F.M. - Masons
32662	662	Thor Trowel	F.M. - Masons
32663	663	Essicks Plaster Mixer	F.M. - Masons
32664	664	Essicks Plaster Mixer	F.M. - Masons
32666	666	Homelite Pump	Service
32667	667	Homelite Pump	Service
32668	668	Homelite Pump	F.M. - North Area

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32670	670	Porto Power Pump	Service
32673	673	Emergency Fire Pump	F.M. - Prev. Maint.
32676	676	Homelite Geneator	F.M. - Shops
32677	677	Homelite Generator	F.M. - Shops
32680	680	Kohler Light Plant	F.M. - Shops
32683	683	Emergency Generator-Diesel	F.M. - Prev. Maint.
32684	684	Emergengy Generator-Diesel	F.M. - Prev. Maint.
32700	700	Welders - Portable	Scattered
32701	701	Welders - Lincoln	F.M. - Planners
32702	702	Welders - Construction	Scattered
32703	703	Welders - Lincoln	F.M. - Planners
32704	704	Welders - Portable	F.M. - Planners
32710	710	Welder	F.M. - Planners
32725	725	Miller Sigma Welder	F.M. - Pot Rebuild
32726	726	Miller Sigma Welder	F.M. - Pot Rebuild
32727	727	Miller Sigma Welder	F.M. - Pot Rebuild
32728	728	Miller Sigma Welder	F.M. - Pot Rebuild
32729	729	Miller Sigma Welder	F.M. - Pot Rebuild
32730	730	ECL Stud Pulling Machine - General	F.M. - Cranes
32731	731	ECL Stud Pulling Machine - #731	F.M. - Cranes
32732	732	ECL Stud Pulling Machine - #732	F.M. - Cranes
32733	733	ECL Stud Pulling Machine - #733	F.M. - Cranes
32734	734	ECL Stud Pulling Machine - #734	F.M. - Cranes
32735	735	ECL Stud Pulling Machine - #735	F.M. - Cranes
32736	736	ECL Stud Pulling Machine - #736	F.M. - Cranes
32737	737	ECL Stud Pulling Machine - #737	F.M. - Cranes
32738	738	ECL Stud Pulling Machine - #738	F.M. - Cranes
32739	739	ECL Stud Pulling Machine - #739	F.M. - Cranes
32740	740	ECL Stud Pulling Machine - #740	F.M. - Cranes

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32741	741	ECL Stud Pulling Machine - #741	F.M. - Cranes
32750	750	Trailer	Line 5
32755	755	Trailer - Welding	F.M. - Planners
32756	756	Trailer - Welding	F.M. - Planners
32760	760	John Deere Trailer	F.M. - Pot Rebuild
32762	762	Lindsay Trailer	Potline Pole
32763	763	Lindsay Trailer	Potline Pole
32765	765	Fab Trailer	Carpenter/Paint
32766	766	Fab Trailer	Pot Control
32767	767	Fab Trailer	F.M. - Area 1
32771	771	Metal Transfer Trailer	Rod Mill
32772	772	Metal Transfer Trailer	Rod Mill
32773	773	AAC Trailer	Casting
32775	775	Slab Trailer	Potlines
32776	776	Slab Trailer	Potlines
32777	777	Freuhauf Trailer	Service
32778	778	Fox Sander Trailer	Service
32780	780	100 Ton Cathode Trailer	Service
32790	790	Portable Conveyor	Service
32802	802	Homelite Chain Saw	Carpenter/Paint
32805	805	Bicycles	Potlines
32807	807	Toro Mower	Service
32808	808	Toro Mower	Service
32809	809	Toro Mower Service	Service
32810	810	Lawn Mower	Service
32811	811	Power Rake	Service
32813	813	1978 Ohio Lifting Magnet	Service
32814	814	1980 Hi-Ranger	F.M. - Planners
32816	816	1969 Bolens Yard Tractor	Service
32817	817	1978 Sears Snow Thrower	Service
32818	818	1963 Ford Tractor	Service
32819	819	1979 '4600' Ford Diesel Trac. & Mower	Service
32820	820	1976 J.L.G. Highlift	F.M. - Planners
32821	821	1979 Drott Carry Deck	F.M. - W. Plant
32823	823	1977 Drott Hyd. Crane	F.M. - E. Plant
32824	824	1977 Drott Cruz-Air w/hammer	Service
32825	825	1966 Pettibone Hyd. Crane	Service

VEHICLE ACCOUNTS

Account Number	Vehicle Number	Description	User
32826	826	Bantam Crane (Matelich Rental)	Construction
32827	827	J.L.G. Highlift	F.M. - Planners
32828	828	1963 Link Belt Motor Crane	Service
32831	831	1979 Warner Swassy Gradall	Service
32849	849	Cat. Traxcavator	Service
32850	850	1953 Caterpillar D-8	Service
32851	851	1953 Caterpillar Grader	Service
32902	902	Equipment	F.M. - Garage
32904	904	1955 Locomotive	Service

FIELD MAINTENANCE

ARCO METALS COMPANY

ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

MECHANICAL SHOPS:	Maximum Capacities:
	74" Vertical Boring Mill 3" Radial Arm Drill - 5' Arm 16' Planer 28" x 28' Gap Bed Lathe #4 Universal Milling Machine 6' x 5/16" Plate Roll 5/8' x 10' Mild Steel Shear 1 5/16" x 1" Punch 400 Ton Press Break Gas and Electric Welding including MIG, TIG, Stick, Wire Feed.
One assigned to Field Maint.	1-2 Ton Bridge Crane 3-5 Ton Bridge Crane (see p. 44) 1-10 Ton Bridge Crane
Assigned to Field Maint.	1-25 Ton Bridge Crane (see p. 44)

FIELD MAINTENANCE CRANES

Crane No.	Machine No.	Crane Cap.	Crane Location	Bot/Crane to Floor	Top/Rail to Floor	Ref. Dwg.	Bot/CPB to Floor	Nock Limit Wall to Wall
CH-22349		10-ton	North end of Casting	13' - 11¼"	16' - 1½"	AJ-12		
CHL-18977	EDR-7449	10-ton	South end of Casting	13' - 11¼"	16' - 1½"	AJ-12		
ECL 1-11			Potlines	25' - 0½"	29' - 0"		14"	
7, 8, 9		15-ton	Potlines, Sheds	~ 26'	29' - 0"			
13		15-ton	Potlines, Sheds		29' - 0"			
10, 11		50-ton	Potlines, Sheds		29' - 0"			
14		50-ton	Potlines, Sheds		29' - 0"			
	EDR-772	Two 5-ton	Garage					
	EDR-9014	One 10-ton	Garage					
		One 5-ton	Battery Shop					
		One 5-ton	Motor Rebuild					
	AL-18	One 5-ton	Mech. Shops		26' - 0"	* Pot Reline		
	AL-364	One 25-ton	Mech. Shops		46' - 0"	* Untanking tower		

* Crane located in Mechanical Shops

RECTIFIER STATION AND SWITCHYARD OPERATION

RECTIFIER STATION AND SWITCHYARD OPERATION

INTRODUCTION

The purpose of this report will be two-fold. One purpose is to present the equipment used in the Rectifier Station and to show how it is connected to allow delivery of direct current power to the potlines. The second is to explain how the Rectifier is operated and how this operation affects the potlines. It should be noted that potline operation also affects the Rectifier operation.

DESCRIPTION AND LAYOUT OF EQUIPMENT

230 KV LINES

The ARCO Aluminum Plant at Columbia Falls receives its power from the Bonneville Power Administration system. The power enters the switchyard on three lines at the 230,000 volt level. See the potline power schematics which follow this page. The schematics only show the Potline No. 1 and No. 2 areas of the switchyard but they are typical of the rest of the switchyard. Only two of the three incoming lines are shown here. The third line comes from Libby Dam. The switching arrangement is such that the plant can be fed from any one or all the lines, although it takes at least two lines to carry our load of approximately 372,000 kilowatts.

The 230 KV lines also have a capacitor bank which can be switched in or out. During periods of low voltage these capacitors are usually switched in to bring the voltage back within allowable limits.

The 230 KV to 13.8 KV stepdown transformers are connected to the source voltage through switches. These transformers (shown on Sheet 1 of drawings) change the voltage from 230,000 volts AC to approximately 13,800 volts AC. This lower voltage is easier to handle and control. This plant has seven stepdown transformers, one for each potline and two spares. The transformers are numbered 1 through 7. The following table shows the seven transformers and the potline with which they are normally associated.

Transformer Number	Normally Feeds
1	Potline 1
2	Spare
3	Potline 2
4	Potline 3
5	Potline 4
6	Spare
7	Potline 5

Through switching with disconnects, the spare banks can be used to feed any potline in an emergency.

13,800 VOLT EQUIPMENT

After leaving the stepdown transformer, the power is fed through an electrically operated oil circuit breaker (OCB). In the case of Potline 1, this would be 52-1 OCB. This particular breaker is the dividing line for maintenance between BPA and ARCO Aluminum. BPA maintains the 52 OCB and all equipment upstream of it. That would include the stepdown transformers, capacitor banks and 230 KV switches. ARCO Aluminum is responsible for maintenance of all transformers, disconnects and equipment downstream (into the plant) of the 52 OCB's.

The first major piece of equipment that is reached that ARCO Aluminum must maintain is the regulator. The purpose of these regulators is to control the power being applied to the potline. We have seven regulators numbered one through seven. The regulator corresponds to the stepdown transformer in its numbering, i.e., Transformer 5 and Regulator 5 feed Potline 4, etc. The regulators have two sets of contacts. The major set (no-load taps) determines the approximate range through which the regulator may be operated under load. In order to change from one no-load tap to another, the potline must be dropped (shut off) in order to make the change. Once the load has been dropped, the operator in the Rectifier Control Room can change the taps through remote control. This process normally takes one to two minutes. The other set of contacts are the ones normally used to regulate the load to the potlines within the limits of the no-load tap on which the regulator is set. These contacts draw an arc when they are switched which causes them to wear. For this reason the Operator does no unnecessary tapping of the regulators. Excessive tap changing would require excessive contact maintenance on the regulators. The power control achieved by the regulator is not continuous but rather in discrete steps. Each step may change potline DC current from 200 to 1500 amps. The amount of the step is greatly dependent on the relative resistance of the potline (how the line is adjusted).

After leaving the regulators, the power is applied to phase shifting transformers which shift the phase of some of the power so that a relatively smooth ripple free DC current can be achieved. The power then leaves the phase shifters and goes to the rectifier transformer. This transformer is essentially a stepdown transformer which changes the voltage from 13,00 volts to approximately 560 volts. This voltage will of course depend on the setting of the regulator. There are eight rectifier transformers in Potlines 1 & 2 and 6 rectifier transformers in Lines 3, 4, & 5. Each rectifier transformer feeds two rectifier frames.

D. C. RECTIFIER EQUIPMENT

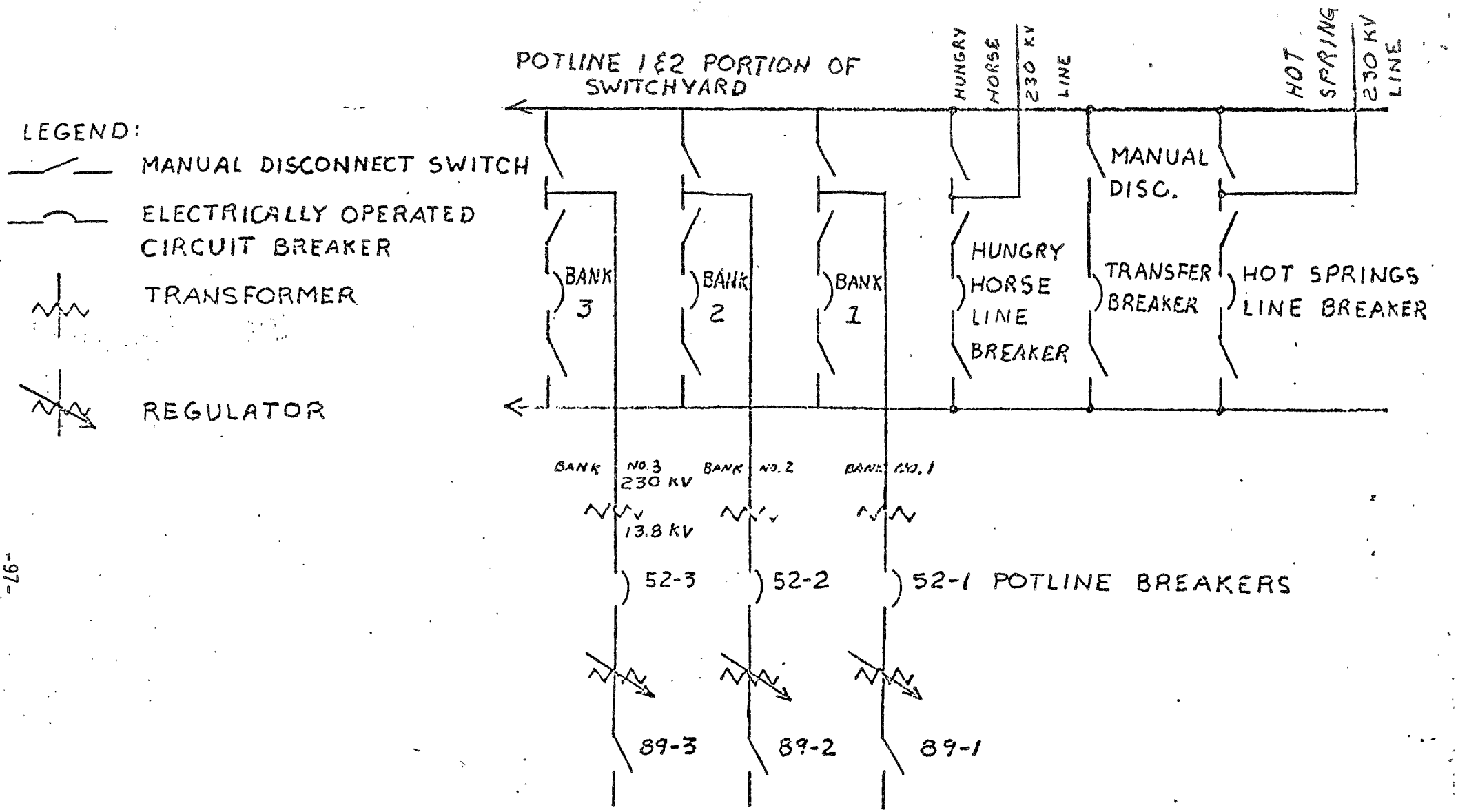
In Potlines 1 & 2, the solid state rectifier equipment was supplied by Westinghouse. This equipment replaced the old mercury-arc converters which had many maintenance problems. The Westinghouse diodes are water cooled and so are dependent on cooling water for operation. In the event of a water failure the operation of the potline would have to be shut down after a few minutes due to heating of the rectifier diodes.

Potlines 3, 4 & 5 have rectifier units manufactured by General Electric. These units are air cooled. The cooling air is supplied by two large blowers pushing air into the cubicles from the basement.

Also individual exhaust blowers on top of each frame draw air through the cubicles. In the event that the cooling air flow is interrupted, the potline would also be shut down in a few minutes due to excessive heat being accumulated in the frame.

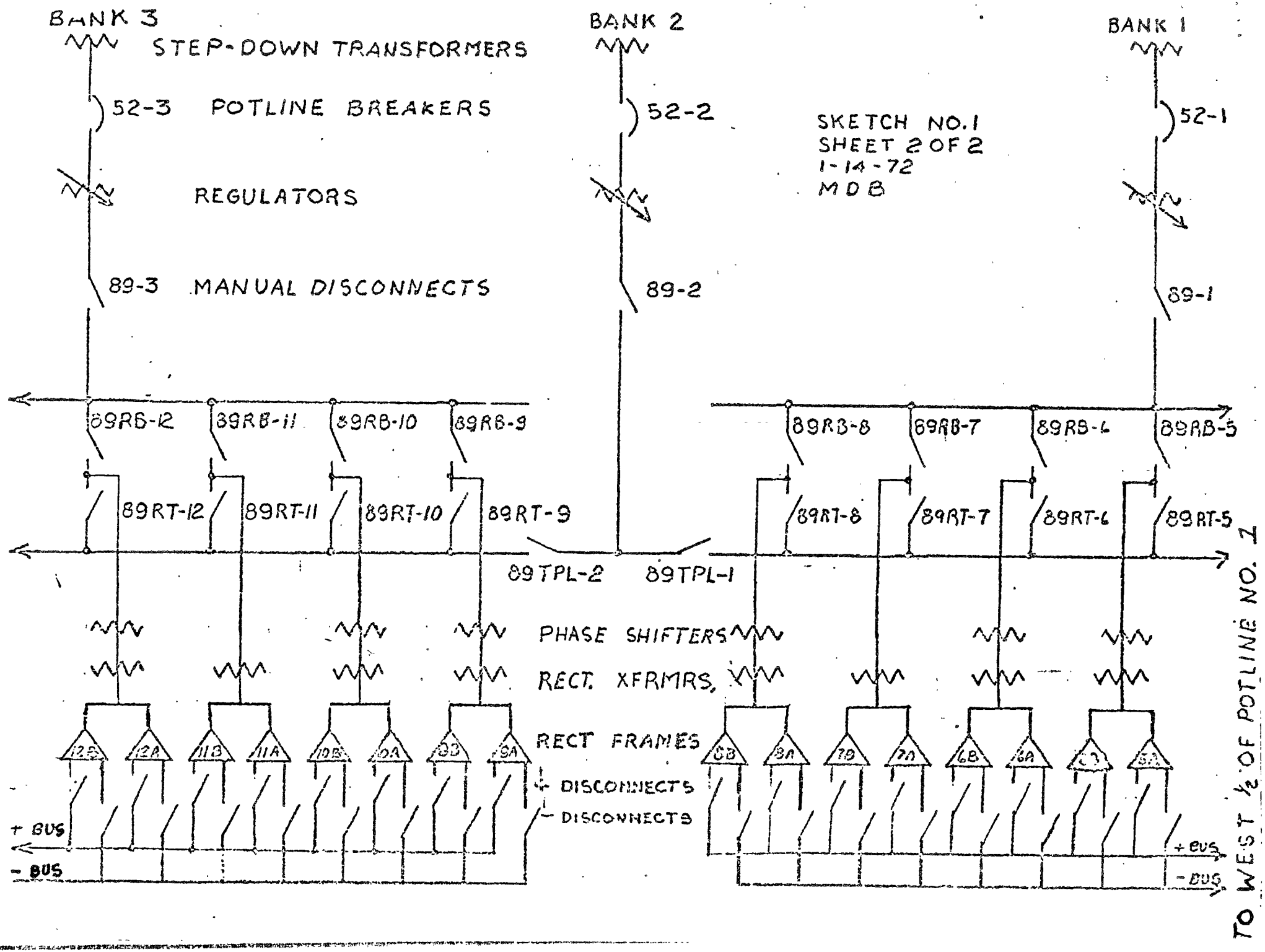
All rectifier frames require periodic maintenance. Dirt accumulates on diode insulators creating the possibility of an arc over. Diodes must be checked to make sure that they are carrying their fair share of current, or others in the circuit may be required to pass current in excess of their rating causing them to fail. This is a large job since Potline 3 alone contains 1584 silicon diodes. The frames also have capacitors. These must be checked for leakage and ability to carry current. If the capacitor fails, it may result in the failure of several diodes. If the capacitor swells up and explodes generating an arc, all the diodes and capacitors in a section of a frame may be destroyed. Tests on other equipment such as fans, motors, pressure switches, etc., must also be performed. For this reason, the normal outage for the maintenance of a set of rectifier frames is about 4 to 6 hours, sometimes longer if trouble is found. Potline current would be reduced during this time in Potlines 1, 2 and 3.

Associated with the rectifier frames are a set of DC disconnects. There are two disconnects for each frame. They are used to isolate the frame from the negative and positive DC buses.



POTLINE POWER SUPPLY TYPICAL OF ALL LINES

SKETCH NO.1
SHEET 1 OF 2
1-14-72
MDB



ENVIRONMENTAL CONTROL EQUIPMENT

ENVIRONMENTAL CONTROL EQUIPMENT AT COLUMBIA FALLS

EQUIPMENT	COST		YEAR	
1. Dry Scrubber System	$5,300,000		1977-78	
2. Lines Four & Five Fans (new)	60,000		1981	
3. Duct-work and Fans Lines 1 & 2	120,944 Fans		1954-55	
4. Duct-work and Fans Line 3	73,548 Fans		1965	
5. Duct-work and Fans Lines 4 & 5	146,704 Fans		1967	
6. Sweepings Baghouse	53,001		1982	
7. West Unloader Baghouse	24,787	$26,558	1954	1981
8. West Bucket Elevator Baghouse	4,679		1954	
9. West Storage Silo Baghouse	6,891		1954	
10. East Unloaded Baghouse	22,654	$13,500	1967	1981
11. East Bucket Elevator	9,684		1967	
12. East Storage Silo Baghouse	7,060		1967	
13. Chemical Silo Baghouse	27,501		1954	
14. Pet Coke Storage & Distribution Baghouse	6,546		1954	
15. Coke & Coal Unloader Baghouse	9,871		1954	
16. Anode Dust Control Baghouse	17,002	$25,109	1954	1975
17. Cathode Dust Control Baghouse	9,721		1954	
18. Dracco Dust Control Baghouse	11,593		1954	
19. Carbon Block Sandblast Baghouse	9,202		1954	
20. Cathode Bar Shotblast Baghouse	15,650		1970	
21. Pinhole Paste Drying Baghouses	5,338		1965	
22. Electro-melt Wet Scrubber	12,000		1968	

Environmental Control Equipment:

(A.) Two Dry Scrubber Systems:

1. One dry scrubber system consists of four (4) reactors, servicing two (2) pot lines.

2. One dry scrubber system consists of six (6) reactors, servicing three (3) pot lines.

The dry scrubbers receive the pot gas from thirty (30) individual fans, which exhaust pot gas from twenty (20) pots each, for a total of 600 pots. The pot gas is moved through a fluidized bed of alumina in the reactors where the hydro-carbons and fluoride is removed and physically combined with the alumina. Each reactor has a baghouse covering it for dust control. Each dry scrubber system also has two (2) nuisance baghouses for collecting miscellaneous dust. All baghouses are pulse-jet units, the reactor baghouses being 40,000 CFM and the nuisance being 4000 CFM. The total cost of the dry scrubber system, including, eighteen new fans and motors in lines one (1), two (2), and three (3), was $5,300,000. Construction was completed in 1978.

In 1981, new fans were installed in Lines Four (4) and Five (5) at a cost of $60,000.

The duct collection system and original fans for Lines One (1) and Two (2) were installed in 1954-55 at a cost of $120,944.

The duct collection system and original fans for Line Three (3) were installed in 1964-65 at a cost of $73,548.

The duct collection system and original fans for Lines Four (4) and Five (5) were installed in 1967 at a cost of $146,784.

(B.) Sweepings Baghouse:

The sweepings baghouse was installed in 1982 at a cost of $53,001. This baghouse is a dust collector servicing the unloading of basement sweeping material and the unloading of special test materials for the paste plant. This is a pulse-jet unit with a capacity of 25,000 CFM.

(C.) West Unloader Baghouse:

The west unloader baghouse was installed in 1954-55 at a cost of $24,787. This baghouse was then converted from a sly flatface to a B.H.A. pulse-jet unit in 1981 at a cost of $26,558. This unit has a capacity of 25,000 CFM. This baghouse is a dust collector for the unloading of rail cars of alumina.

(D.) West Bucket Elevator Baghouse:

The bucket elevator baghouse is a sly flatface, with a capacity of 3000 CFM, and was installed in 1954-55 at a cost of $4,679. This baghouse is a dust collector for the alumina being transported by a bucket elevator.

(E.) West Storage Silo Baghouse:

The storage silo baghouse is a sly flatface, with a capacity of 2000 CFM, and was installed in 1954-55 at a cost of $6,891. This baghouse is a dust collector for the dumping of alumina in the storage silos.

(F.) East Unloader Baghouse:

The East unloader baghouse was installed in 1967 at a cost of $22,654. This baghouse was then converted from a sly roll-clean to a B.H.A. pulse jet unit in 1981, at a cost of $13,500. This unit has a capacity of 7,000 CFM. This baghouse is a dust collector for the unloading of rail cars of alumina.

(G.) East Bucket Elevator Baghouse:

The bucket elevator baghouse is a sly roll-clean, with a capacity of 5,000 CFM, and was installed in 1967 at a cost of $9,684. This baghouse is a dust collector for the alumina being transported by a bucket elevator.

(H.) East Storage Silo Baghouse:

The storage silo baghouse is a sly roll-clean, with a capacity of 2,400 CFM, and was installed in 1967 at a cost of $7,060. This baghouse is a dust collector for the dumping of alumina in the storage silos.

(I.) Chemical Silo Baghouse:

The chemical silo baghouse is a sly flat-face, with a capacity of 2,000 CFM, and was installed in 1954 at a cost of $27,501. This baghouse is a dust collector for the unloading of coke for the paste plant.

(J.) Pet Coke Storage & distribution Baghouse:

This baghouse is a sly flat-face, with a capacity of 8,000 CFM and was installed in 1954 at a cost of $6,546. This baghouse is a dust collector for the coke storage silo and distribution belt to the paste plant.

(K.) Coke and Coal Unloader Baghouse:

This baghouse is a sly flat-face, with a capacity of 7,000 CFM and was installed in 1954, at a cost of $9,871. This baghouse is a dust collector for the unloading of coke and coal and the conveyor to the storage silos.

(L.) Anode Dust Control Baghouse:

The original anode dust control baghouse was a sly flat-face with a capacity of 16,000 CFM and was installed in 1954 at a cost of $17,002. In 1975, a new pulse-jet, 16,000 CFM baghouse was installed at a cost of $25,109. This baghouse is a collector from seventeen (17) pick-up points concerned with the production of anode briquettes.

(M.) Cathode Dust Control Baghouse:

The original cathode dust control baghouse was a sly flat-face with a capacity of 6400 CFM and was installed in 1954 at a cost of $9,721. In 1975 this baghouse was put on stand-by, and the original anode dust control baghouse was renamed the cathode dust control baghouse. This baghouse collects dust from the equipment used to produce cathode paste.

(N.) Dracco Dust Control Baghouse:

There are four (4) Dracco units inter-connected, with a total capacity of 2,252 CFM and were installed in 1954 for a total cost of $11,593. These baghouses collect the excess dust from the two (2) paste plant ball mills.

(O.) Carbon Block Sandblast Baghouse:

This baghouse is a sly flat-face, originally installed on the west chemical silo in 1954, at a cost of $9,202, and a capacity of 3,200 CFM. In 1974 it was moved to the carbon block sand blast area. This baghouse collects dust from the sand blast process.

(P.) Cathode Bar Shot Blast Baghouse:

This baghouse is a Wheelabrator shaker, with a capacity of 3,526 CFM and was installed in 1970 at a cost of $15,650. This baghouse collects dust from the shot blast process.

(Q.) Pinhole Paste Drying Baghouses:

There are two (2) fuller Dracco, shaker type with a combined capacity of 4,530 CFM and were installed in 1965 at a total cost of $5,238. These baghouses collect dust from the past drying silos and unloading system.

(R.) Electro-melt Wet Scrubber:

This scrubber was originally built in 1968 at a cost of $12,000 for a spare pot gas scrubber, and is now installed over the electromelt furnace to scrub the fumes and collect the particulate emissions, and has a capacity of 9,832 SCFM.

ARCO METALS COMPANY

ARCO ALUMINUM

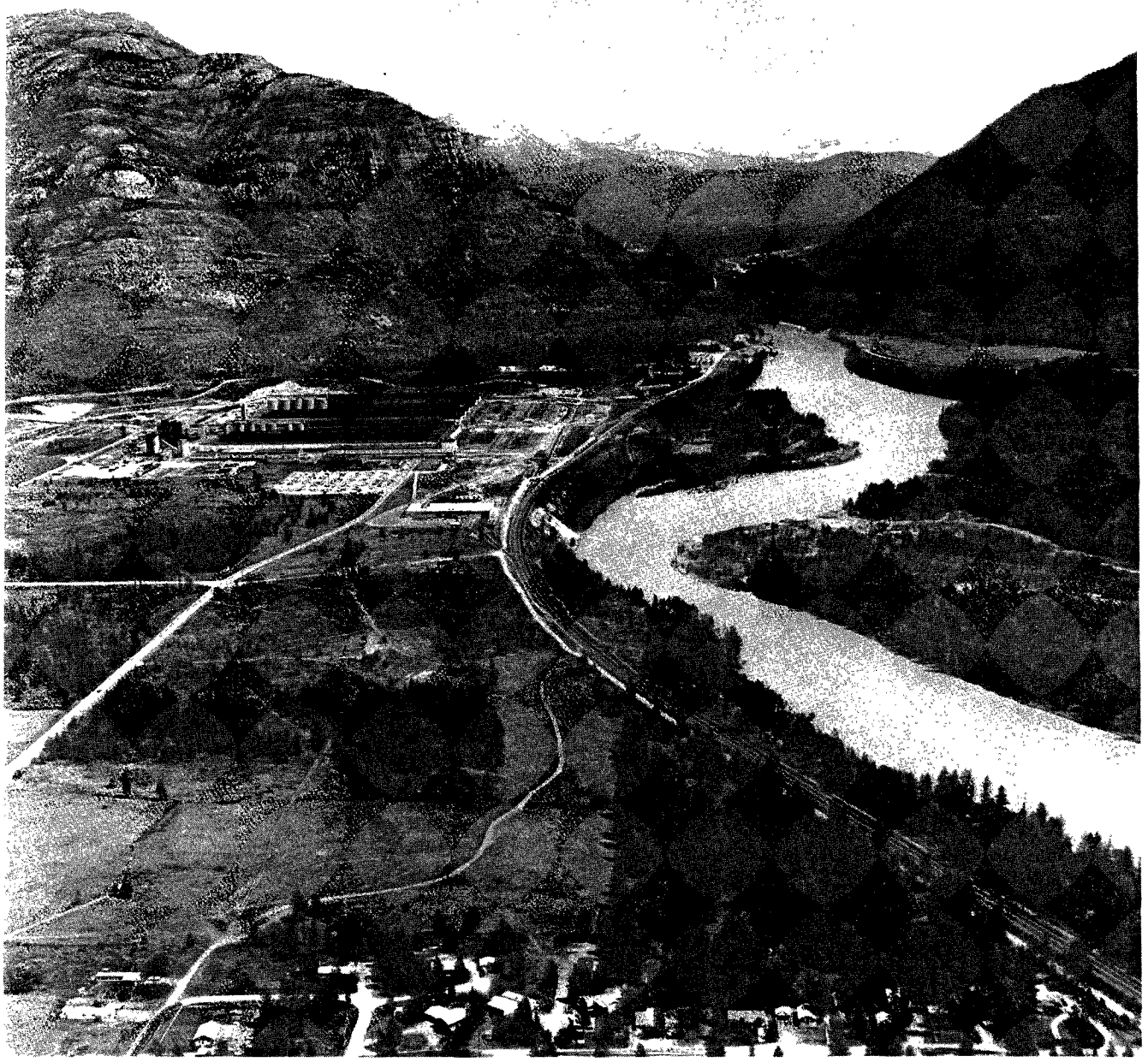
FACILITIES MANUAL

PRIMARY OPERATIONS

SECTION VIII

PHOTOGRAPHS/PLANT LAYOUT/SITE PLAN

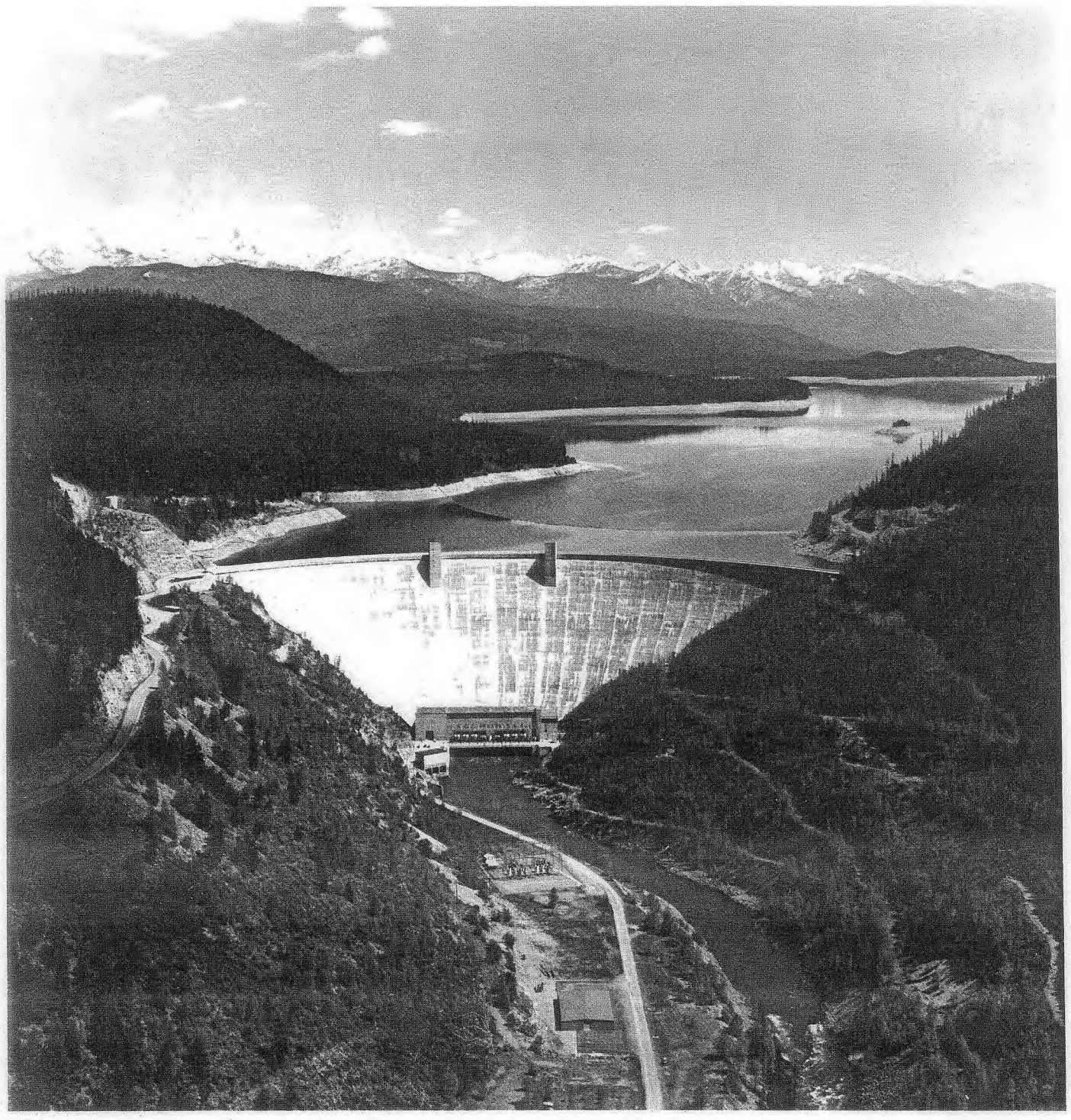
AERIAL VIEW OF COLUMBIA FALLS REDUCTION PLANT. TEAKETTLE MOUNTAIN IS IN THE BACKGROUND.



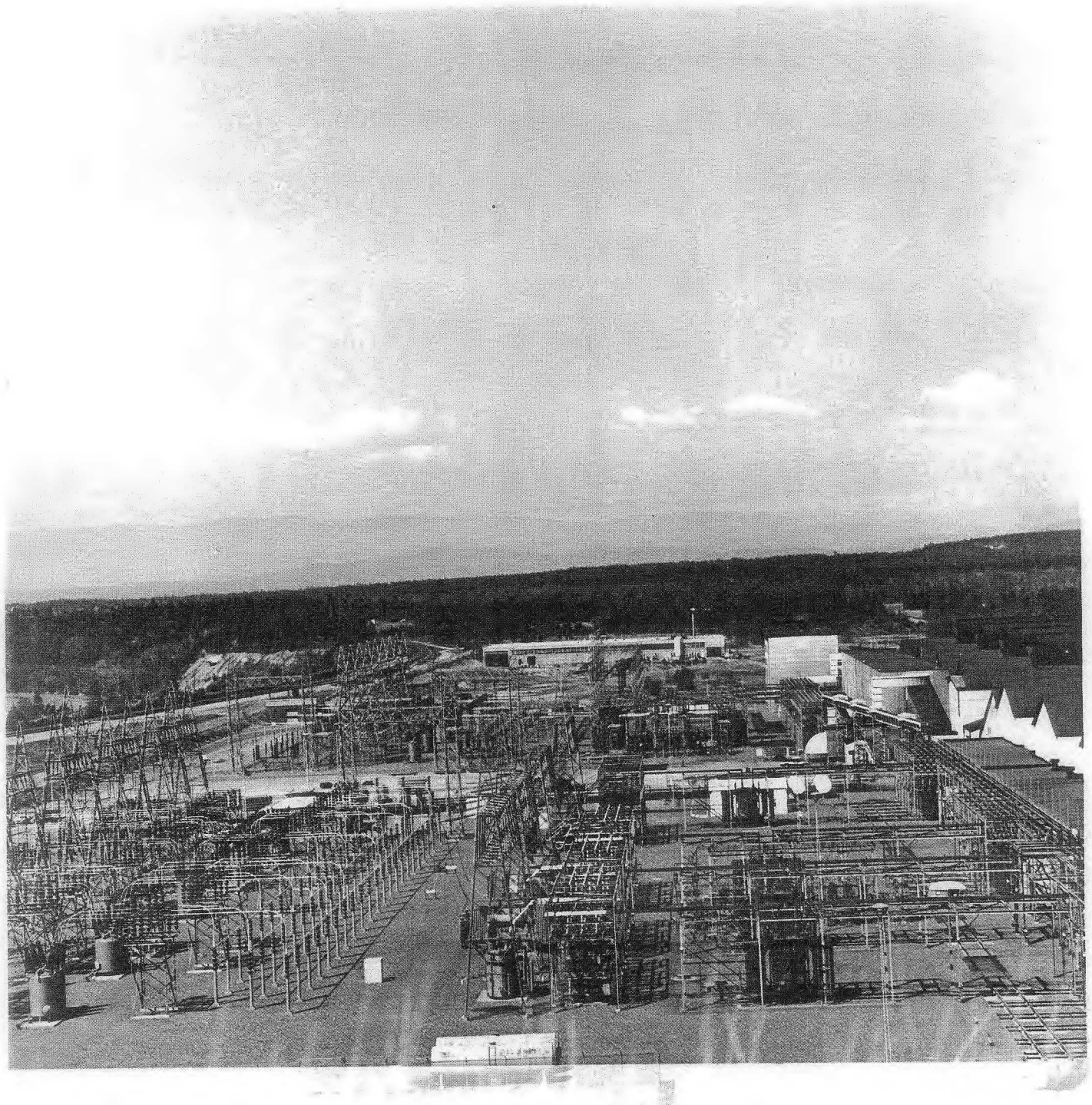
AERIAL VIEW LOOKING EAST WITH FLATHEAD RIVER IN THE FOREGROUND.

AERIAL VIEW LOOKING NORTH WITH THE WHITEFISH MOUNTAIN RANGE IN THE BACKGROUND.

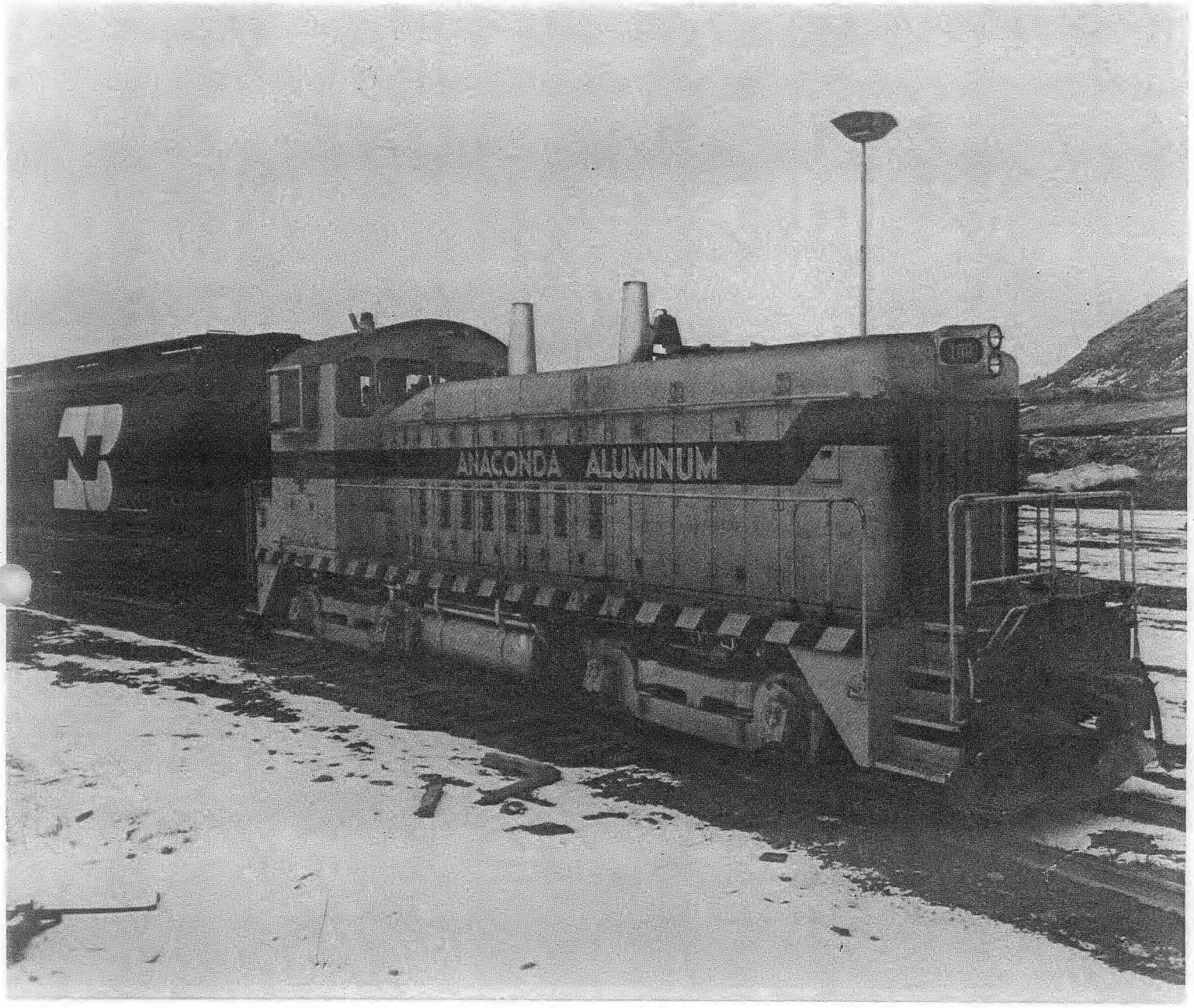
AERIAL VIEW OF HUNGRY HORSE DAM. COMPLETED IN 1953, THE DAM WAS THE MAJOR REASON THE ANACONDA COMPANY DECIDED TO BUILD THE ALUMINUM PLANT IN COLUMBIA FALLS.



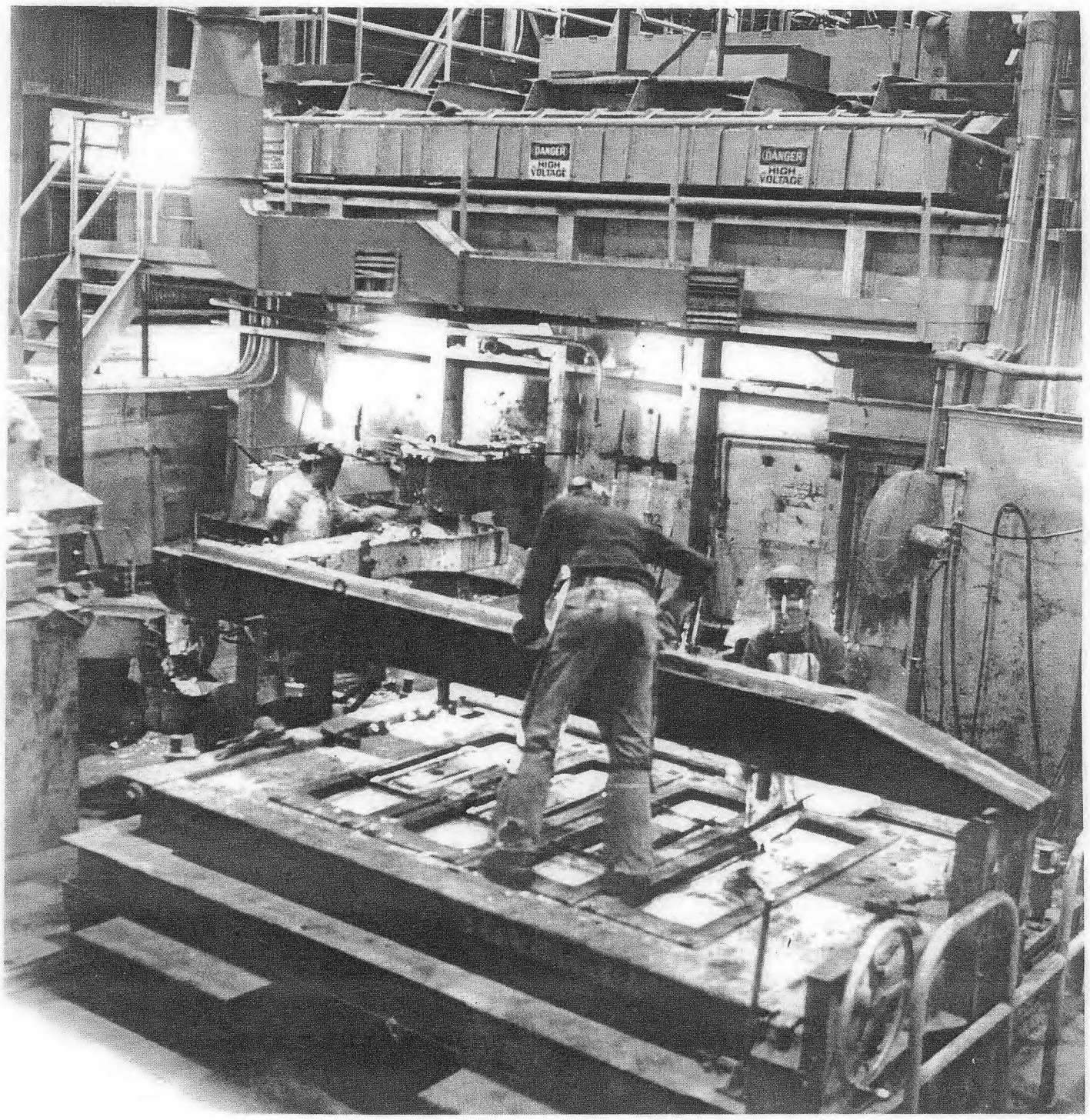
VIEW OF THE CON KELLY SWITCH YARD LOOKING WEST. THREE 250 KV TRANSMISSION LINES FEED THE SWITCH YARD THAT SUPPLIES POWER TO THE PLANT.



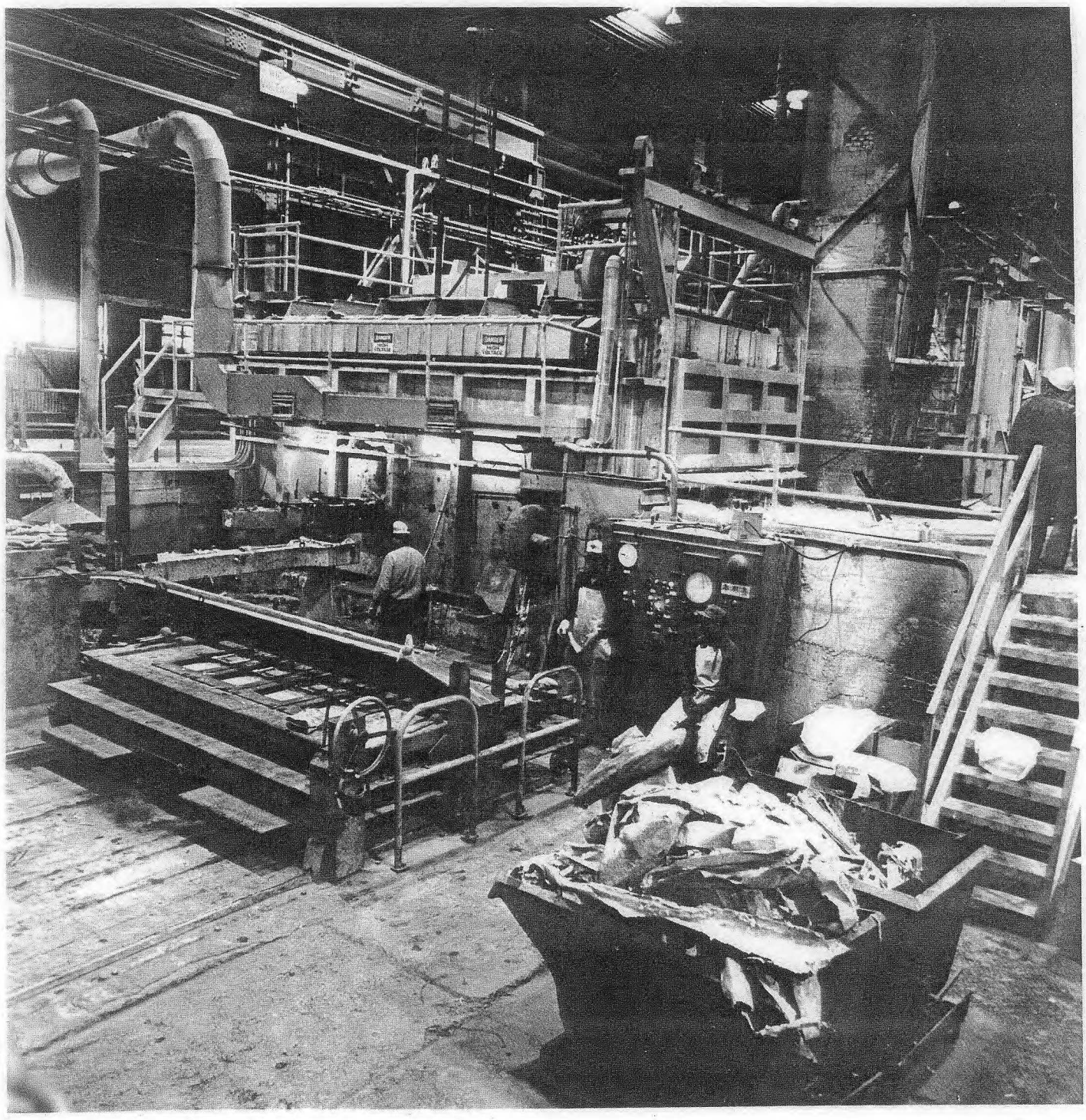
MOST OF THE RAW MATERIAL COMING INTO THE PLANT AND THE INGOT LEAVING IS TRANSPORTED TO AND FROM THE BURLINGTON NORTHERN MAIN LINE BY THE COMPANY'S SWITCH ENGINE OVER SEVEN AND ONE-HALF MILES OF TRACK ON PLANT PROPERTY.



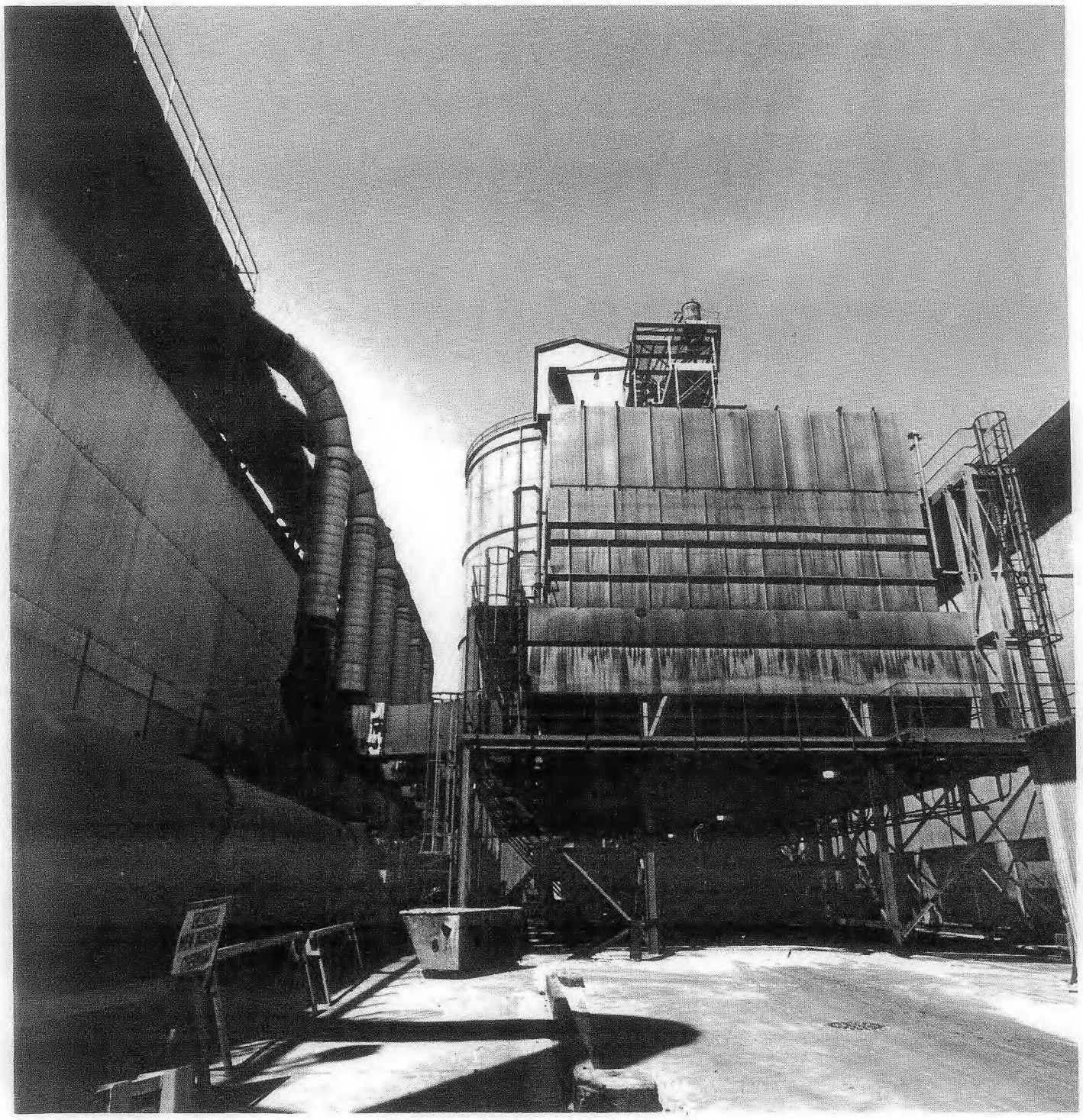
A CASTING PIT WITH ATTENDANT WATCHING AS METAL LEAVES THE HOLDING FURNACE AND FLOWS INTO THE MOLDS. THE MOLDS ARE OF WAGSTAFF DESIGN AND ARE ABOUT FOUR INCHES DEEP. THE METAL IS SOLIDIFIED BY THE APPLICATION OF COLD WATER AS THE INGOT IS HYDRAULICALLY DROPPED INTO THE PIT.



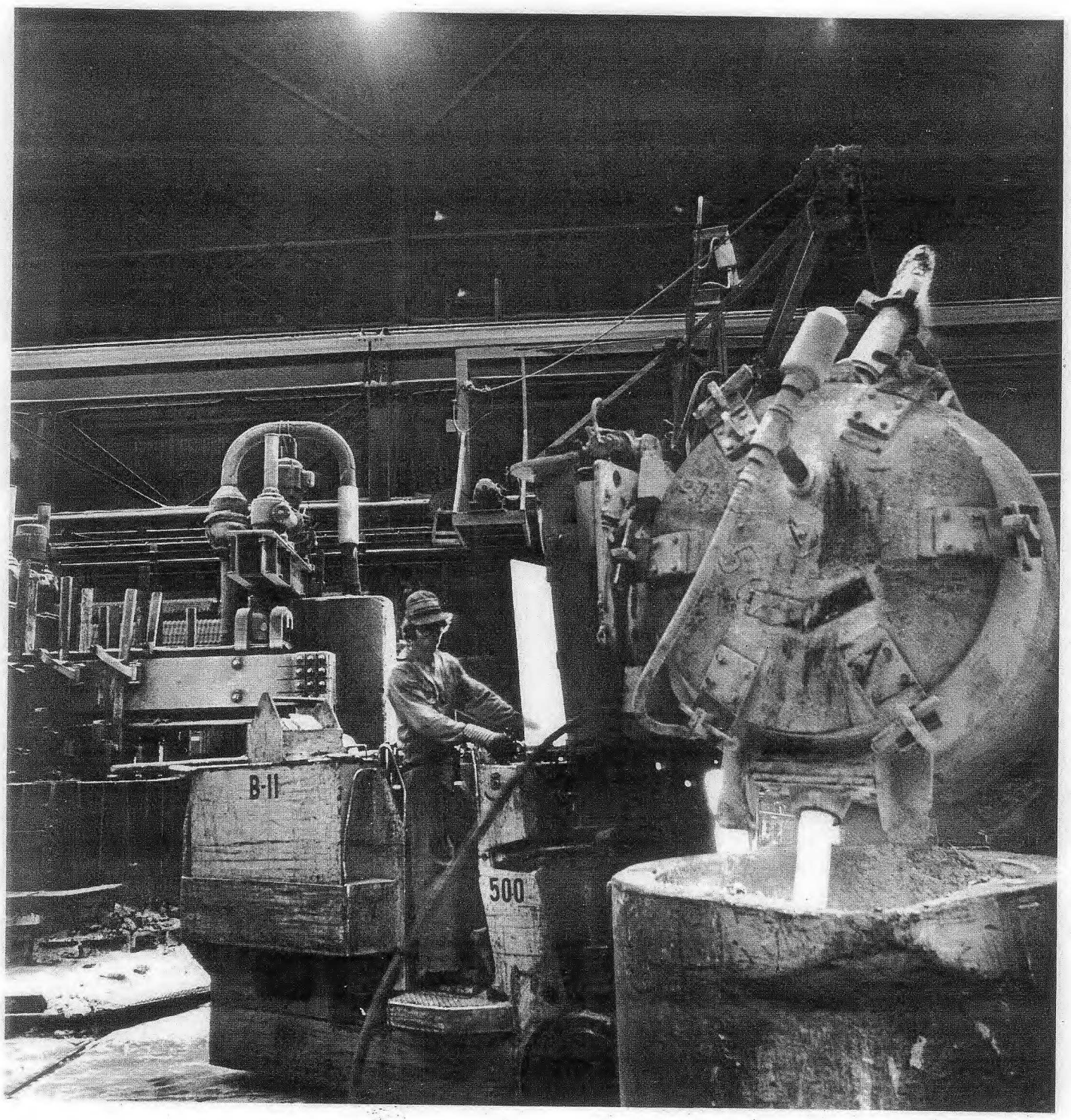
CASTING CREW POURING INGOTS.



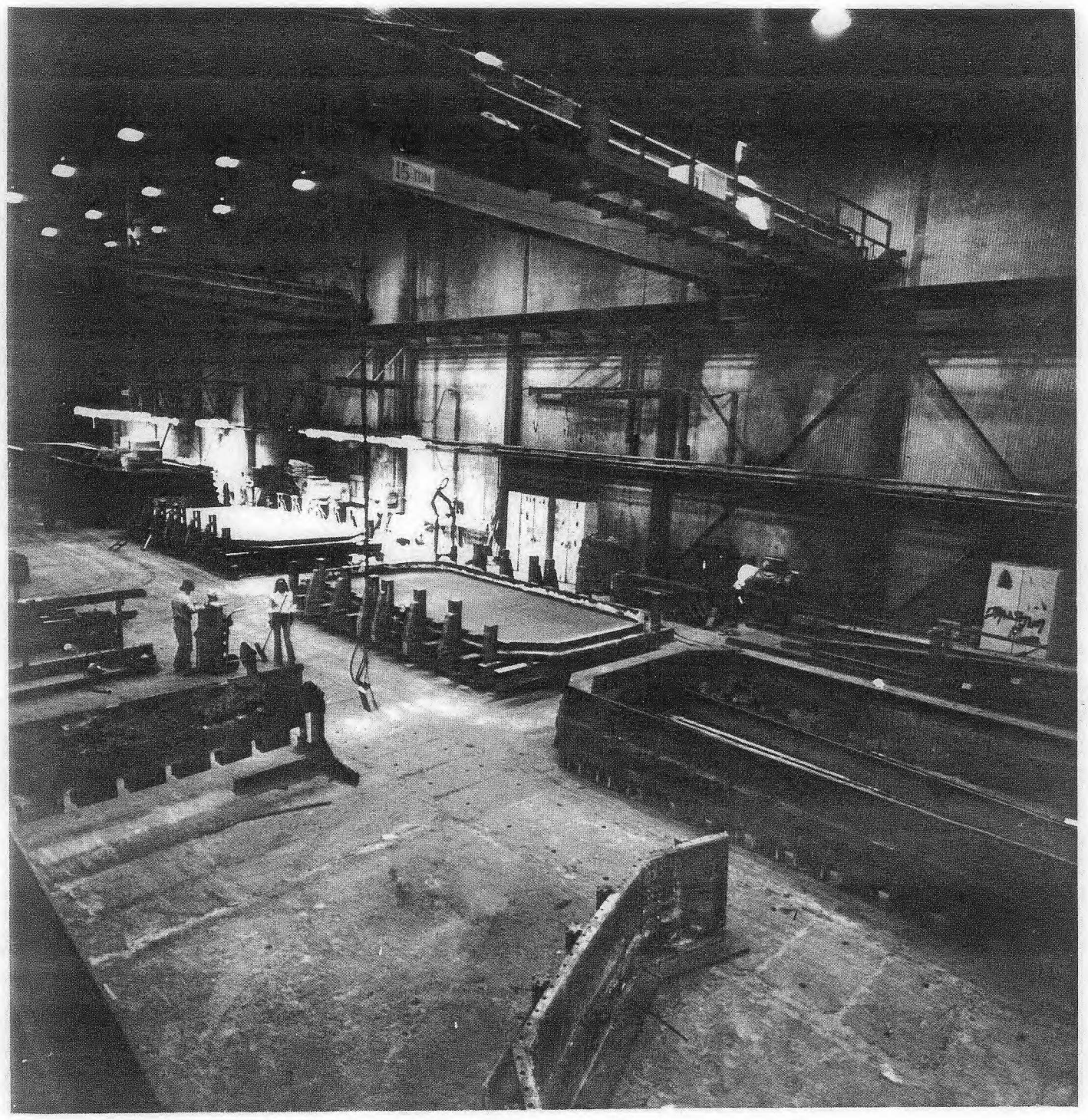
ONE OF TWO ALCOA 398 DRY SCRUBBERS LOCATED ON THE EAST AND WEST ENDS OF THE PLANT. THESE UNITS ARE 99 PERCENT PLUS EFFICIENT IN COLLECTING GASEOUS AND PARTICULATE EMISSIONS.



VACUUM TAPPING CRUCIBLE POURING MOLTEN METAL INTO TRANSFER CRUCIBLE. THE METAL IS CARRIED BY FORKLIFT TRUCKS TO A HOLDING FURNACE WHERE IT IS KEPT IN A MOLTEN STATE UNTIL READY TO BE CAST INTO INGOT.

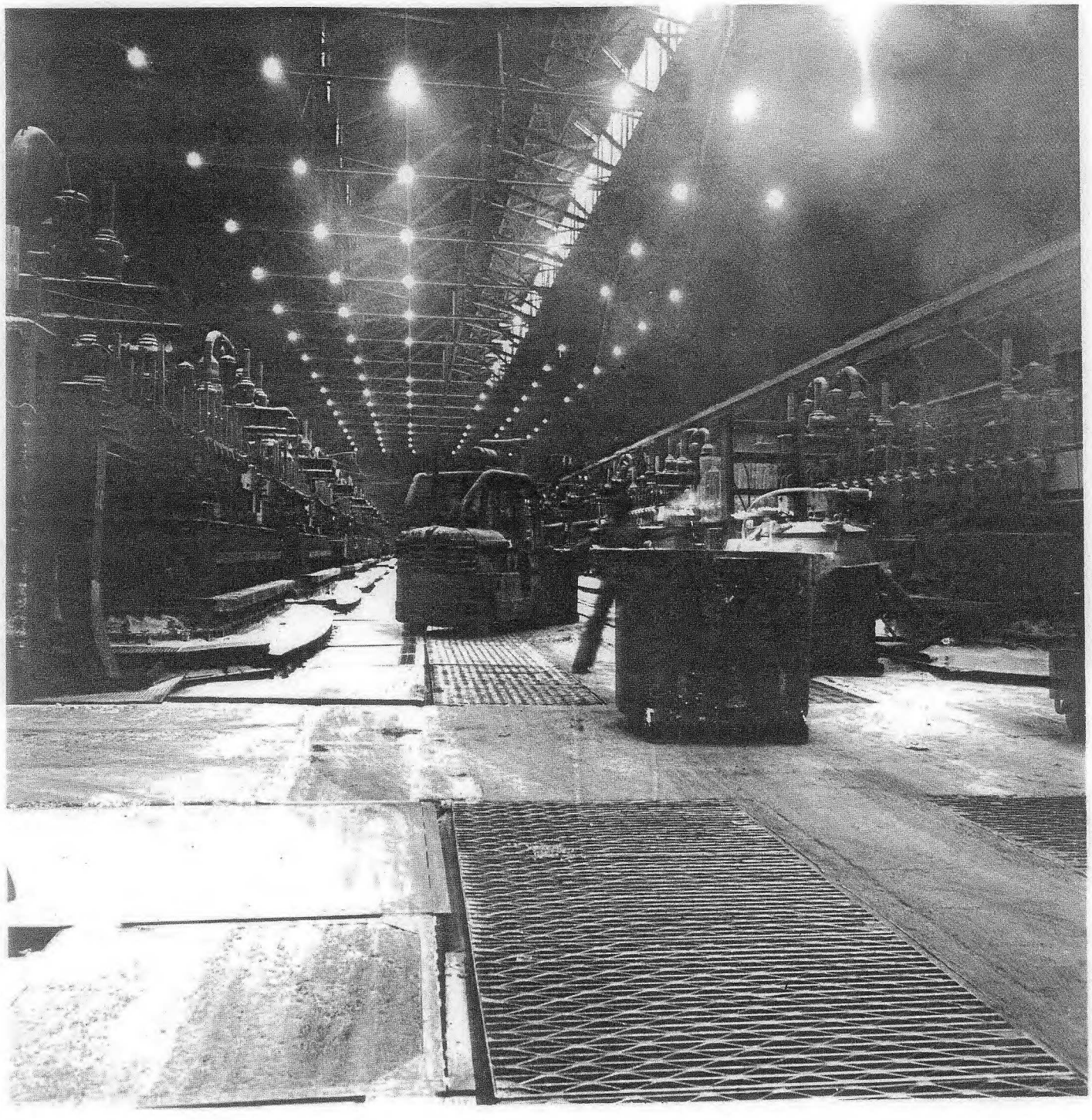


POT REBUILD AREA LOCATED IN THE NORTH END OF THE PLANT. POTS ARE NORMALLY REBUILT AT A RATE OF TWO AND A HALF PER WEEK. STANDARD POT LIFE IS ABOUT FOUR AND ONE-HALF YEARS.

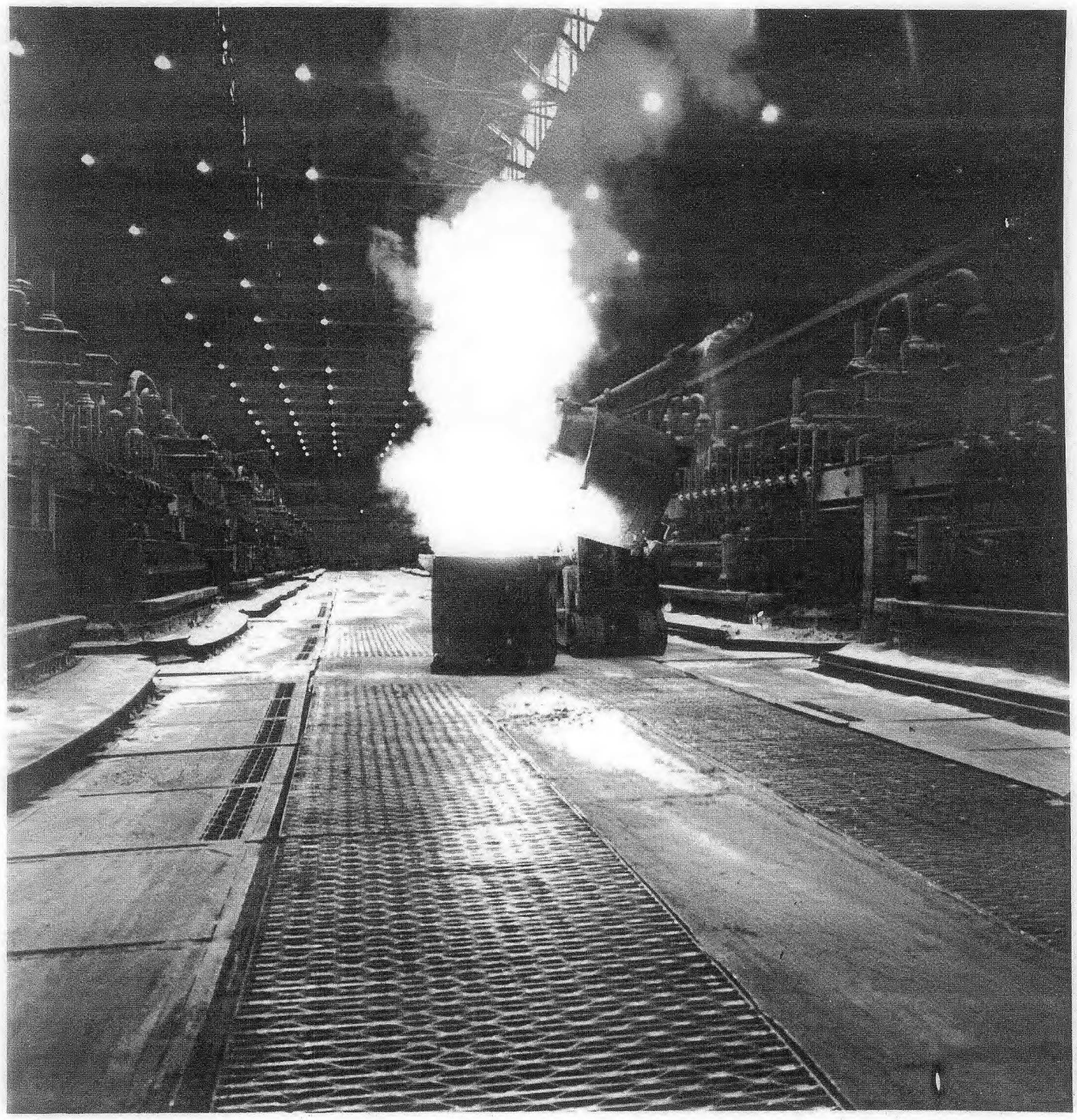


BRIQUETTE TRUCK REPLENISHING SUPPLY OF BRIQUETTES TO THE TOP OF AN ANODE. THE ANODE IS CONSUMED DURING THE ELECTROLYTIC PROCESS AND MUST BE CONSTANTLY RESUPPLIED WITH ANODE MATERIAL WHICH IS A MIXTURE OF PETROLEUM COKE AND COAL TAR PITCH.

A POTROOM SHOWING SOME OF THE PLANT'S 600 ELECTROLYTIC CELLS OR POTS AS THEY ARE CALLED. EACH OF THE 10 POTROOMS HAS 60 POTS WHICH ARE HOUSED IN THE LARGEST BUILDING UNDER ONE ROOF IN THE STATE OF MONTANA.



TAPPING CRUCIBLE POURING MOLTEN METAL INTO A TRANSFER CRUCIBLE. EACH POT IS TAPPED EVERY 48 HOURS AND PRODUCES APPROXIMATELY 1,600 LBS. OF METAL.



ALUMINA STORAGE SILOS LOOKING SOUTH. ALUMINA IS SHIPPED FROM AUSTRALIA TO PORT OF EVERETT, WASHINGTON, THEN TO COLUMBIA FALLS VIA BOTTOM DUMP HOPPER CARS ON THE BURLINGTON NORTHERN LINE.

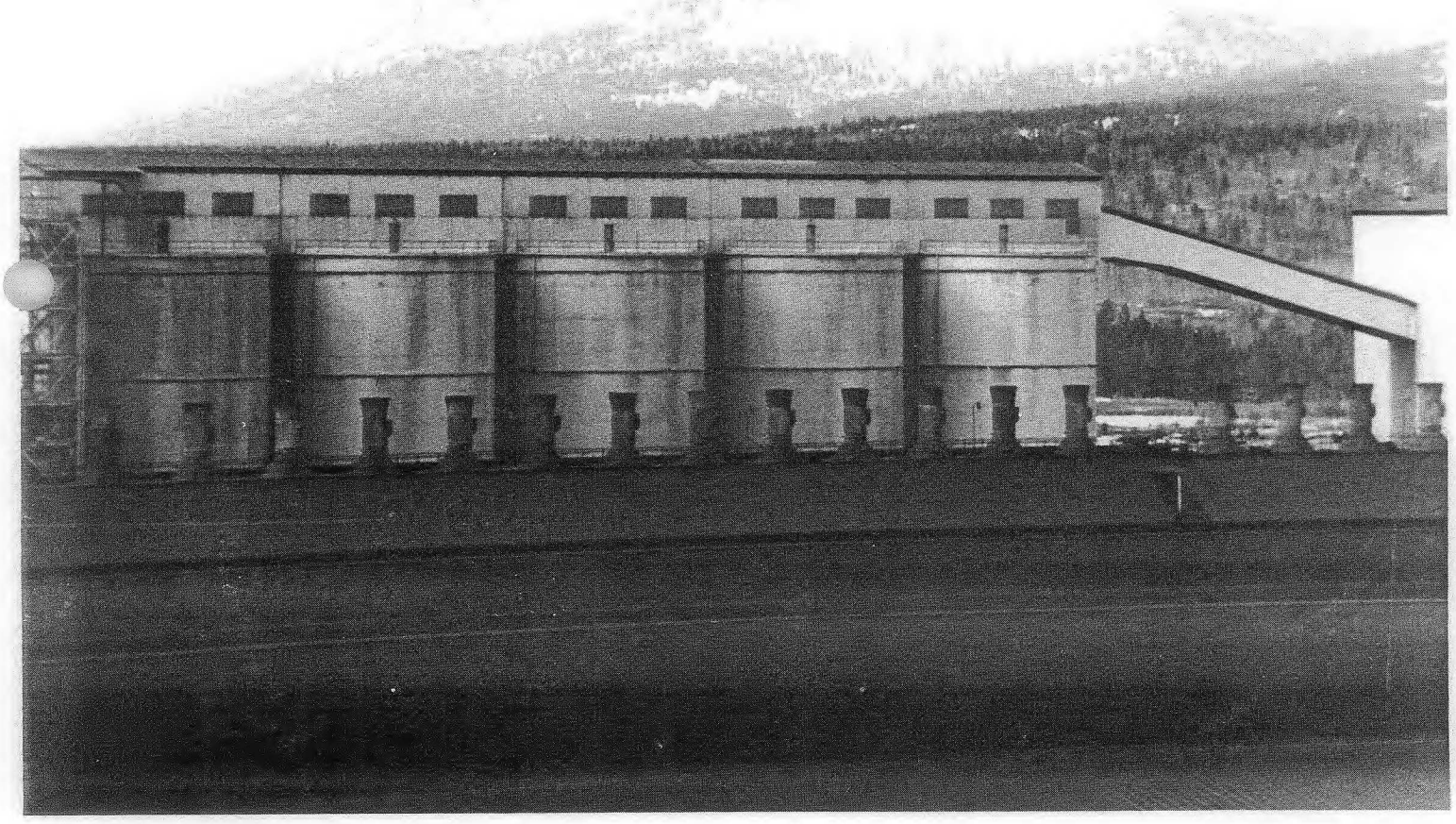
BOILER HOUSE (FOREGROUND) AND CARBON PLANT, COMMONLY CALLED "THE BLACK PALACE."

WORKER IS DUMPING ALUMINA FROM HOPPER CAR ONTO CONVEYOR SYSTEM.

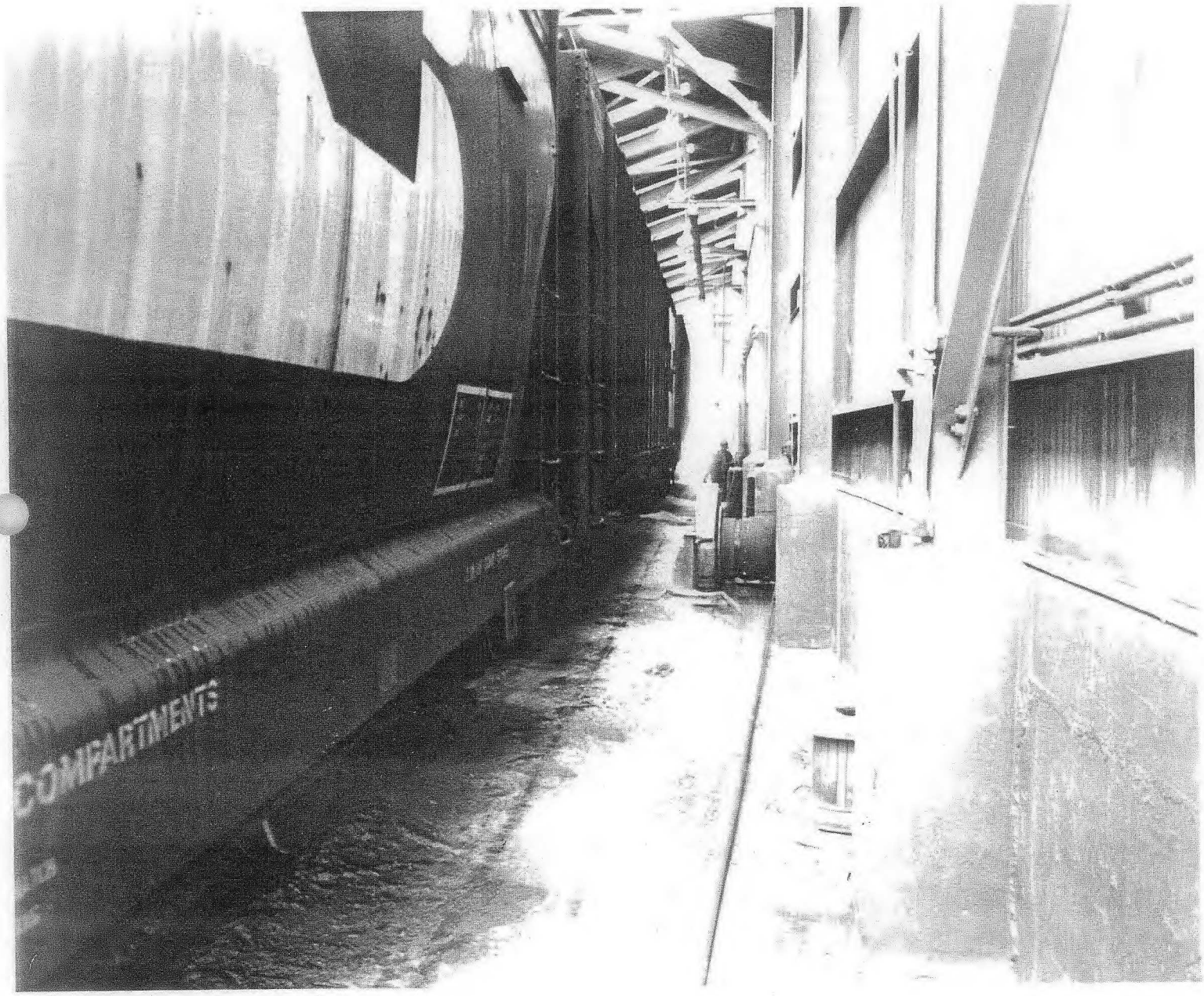
CONVEYOR SYSTEM WHICH TRANSPORTS ALUMINA TO STORAGE SILOS.

ALUMINA CONVEYOR SYSTEM FROM ANOTHER ANGLE.

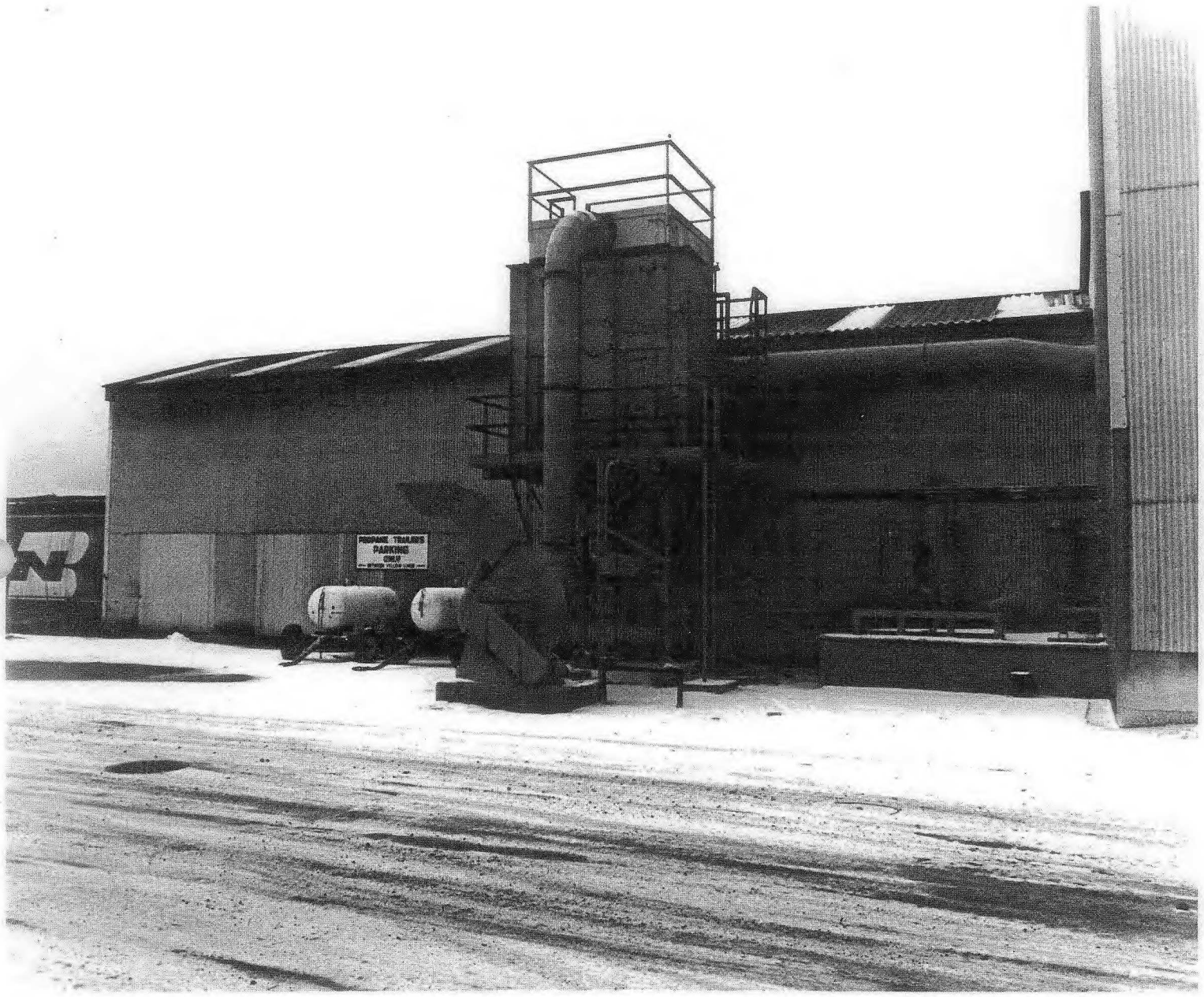
ALUMINA STORAGE SILOS ATOP POTLINE ROOFS. STACKS IN THE FOREGROUND ARE PART OF AN EXPERIMENTAL FOAM SCRUBBER WHICH IS NO LONGER IN USE.



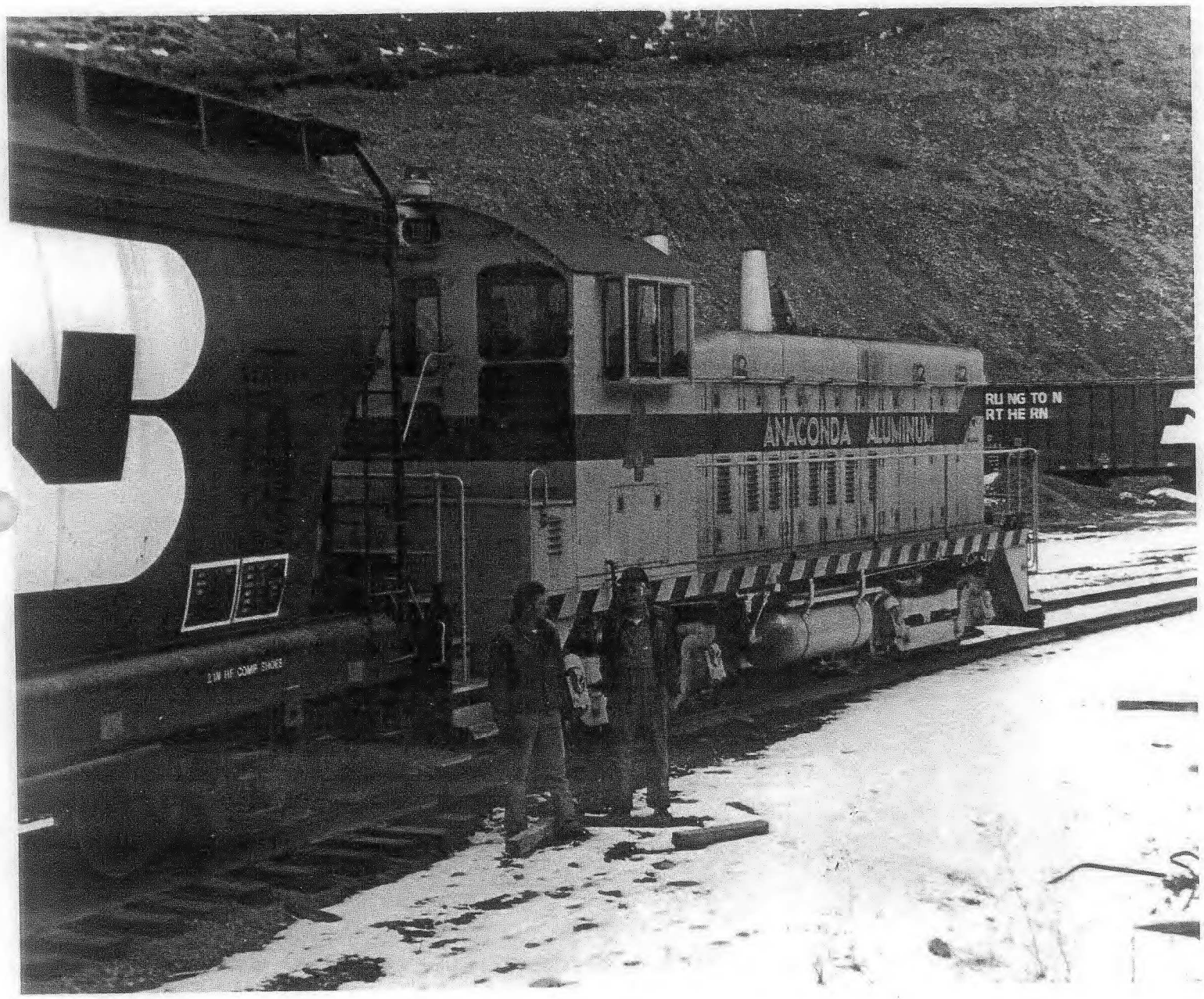
HOPPER CARS IN ALUMINA UNLOADING SHED.



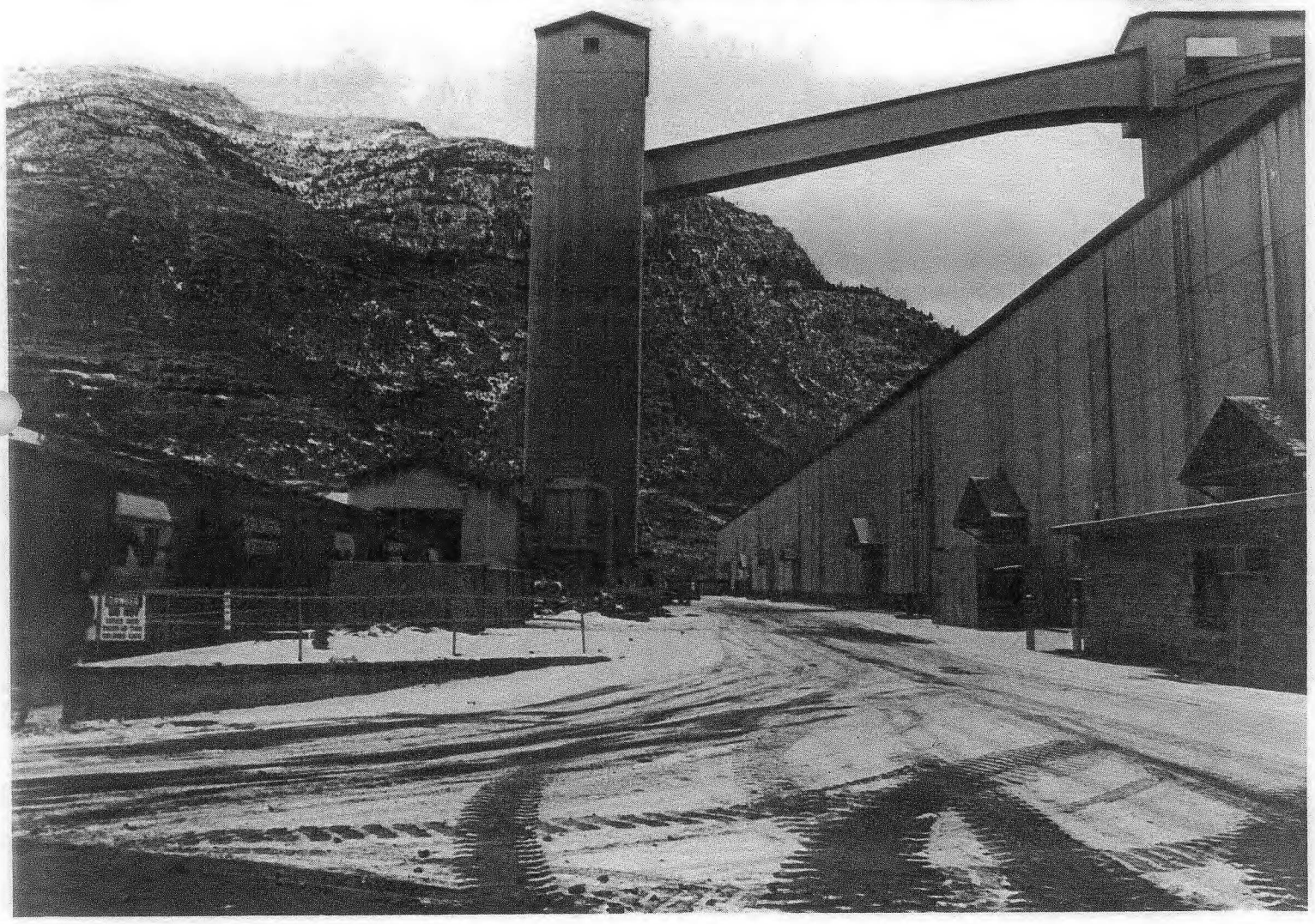
DUST COLLECTING SYSTEM PROVIDES CLEAN ENVIRONMENT FOR WORKERS INVOLVED IN UNLOADING ALUMINA.



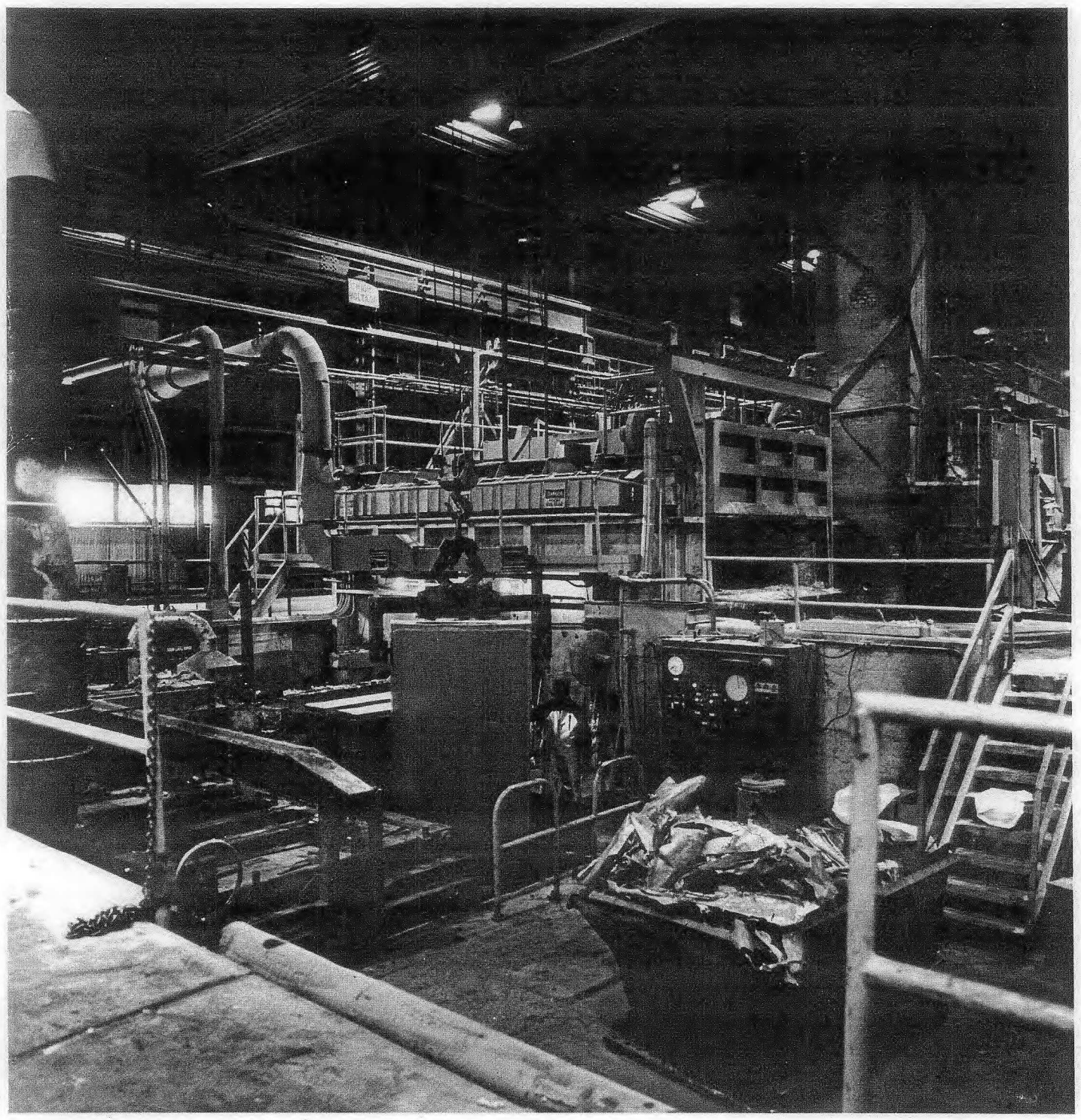
THIS SWITCH ENGINE WAS ACQUIRED FROM THE BUTTE, ANACONDA AND PACIFIC RAILROAD IN 1981 WHERE IT FORMERLY HAULED COPPER ORE CONCENTRATES FROM BUTTE TO THE ANACONDA, MONTANA SMELTER. ITS PREDECESSOR, "OLD 181" WAS BUILT IN 1942 AND WAS ONLY SEVEN OF ITS KIND, ALL BUILT BETWEEN 1939 AND 1942. AS SUCH, IT ATTRACTED THE ATTENTION OF RAILROAD BUFFS FROM ALL OVER THE COUNTRY. THE MAN IN THE BIB OVERALLS IS BUD SENNER, THE ENGINEER AND FIRST HOURLY EMPLOYEE HIRED AT THE PLANT.



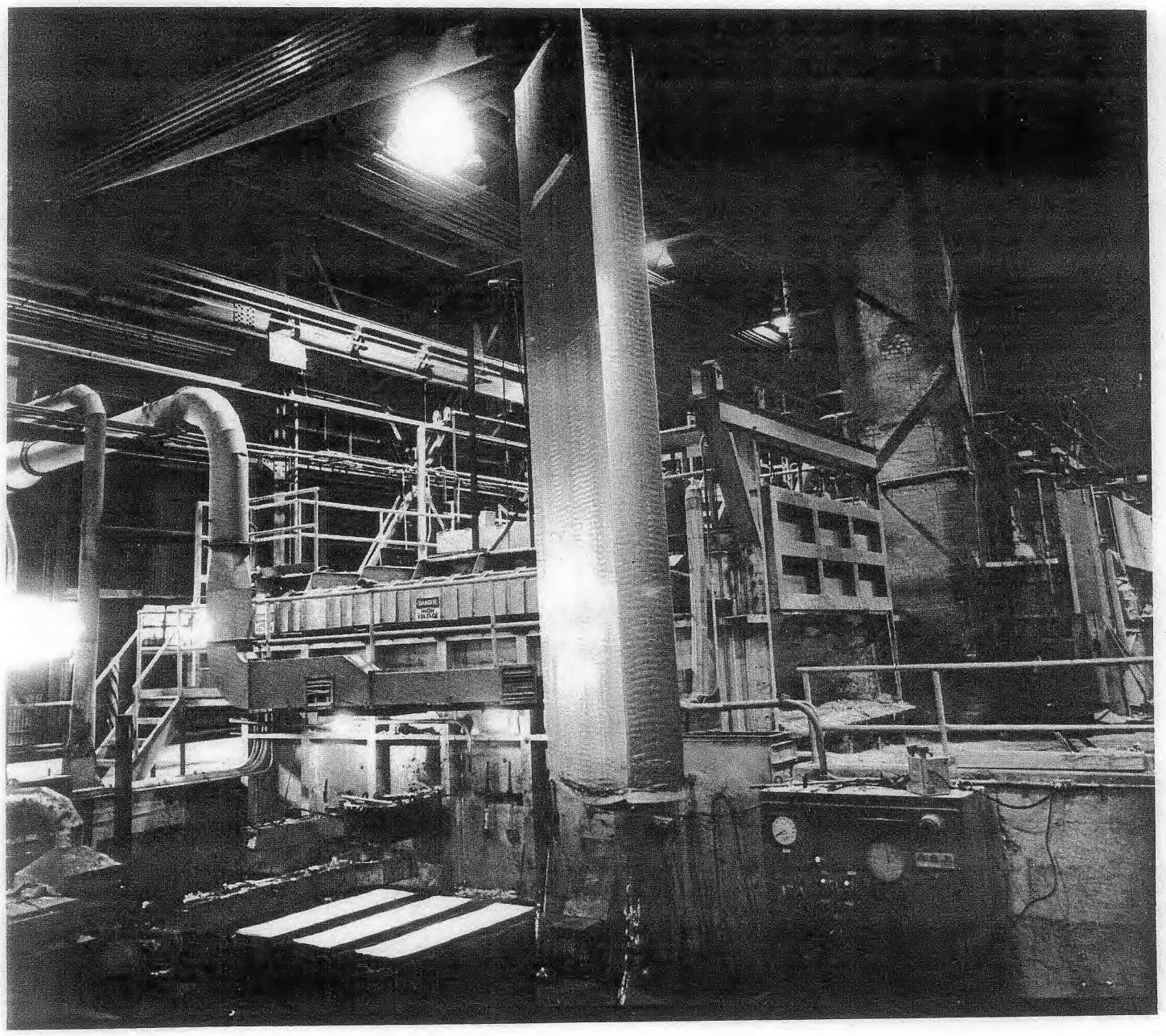
ALUMINA UNLOADING AREA.



CASTING PIT WITH A SHEET INGOT BEING LIFTED AFTER A POUR. THESE INGOTS WEIGH ABOUT 14,000 LBS.



SHEET INGOT BEING LIFTED FROM CASTING PIT BY AN OVERHEAD CRANE.



MOST OF THE INGOT PRODUCED AT COLUMBIA FALLS IS SHIPPED ON SPECIALLY DESIGNED RAIL CARS VIA THE BURLINGTON NORTHERN TO OUR ROLLING MILL IN TERRE HAUTE, INDIANA.

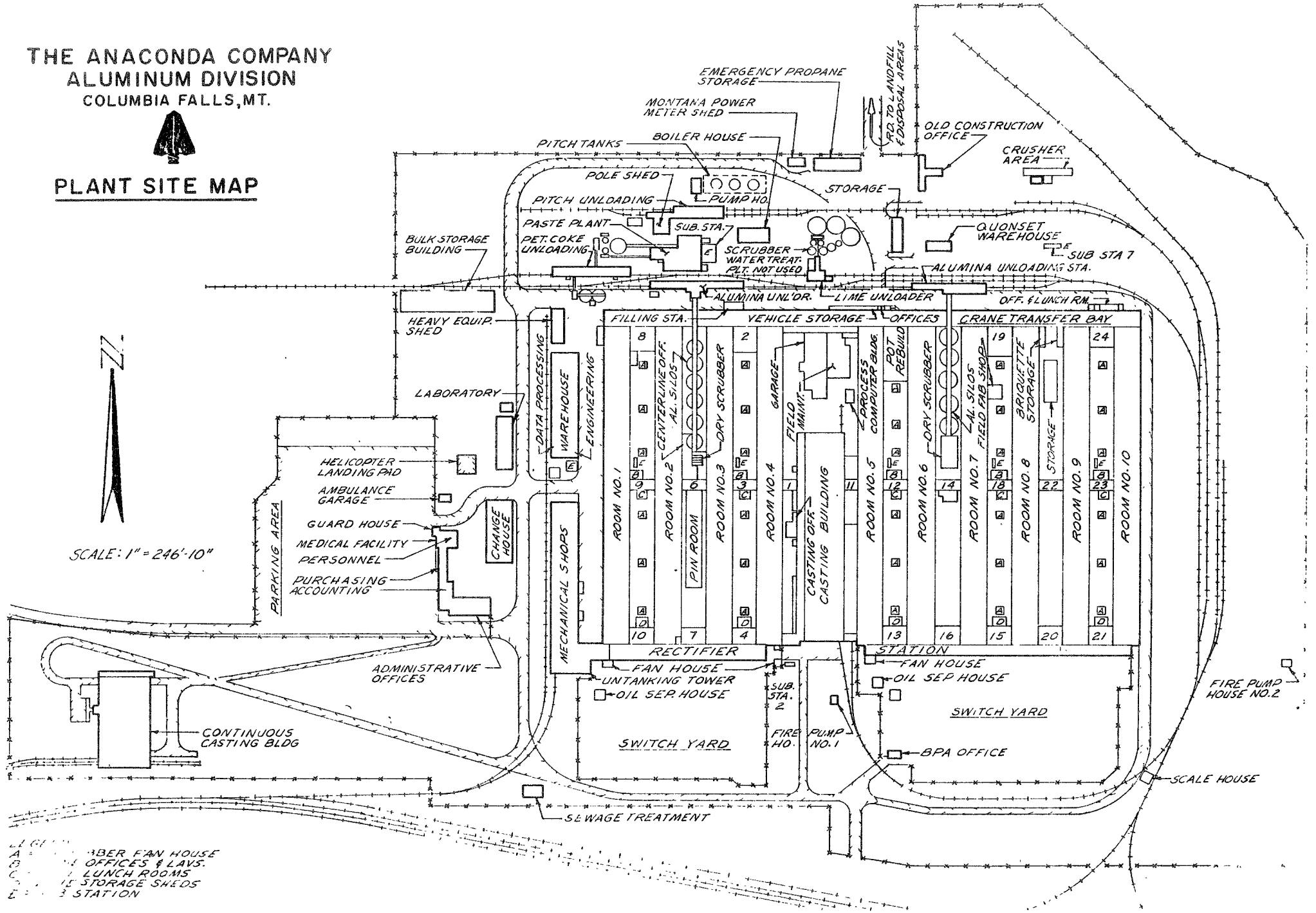
ARCO METALS COMPANY

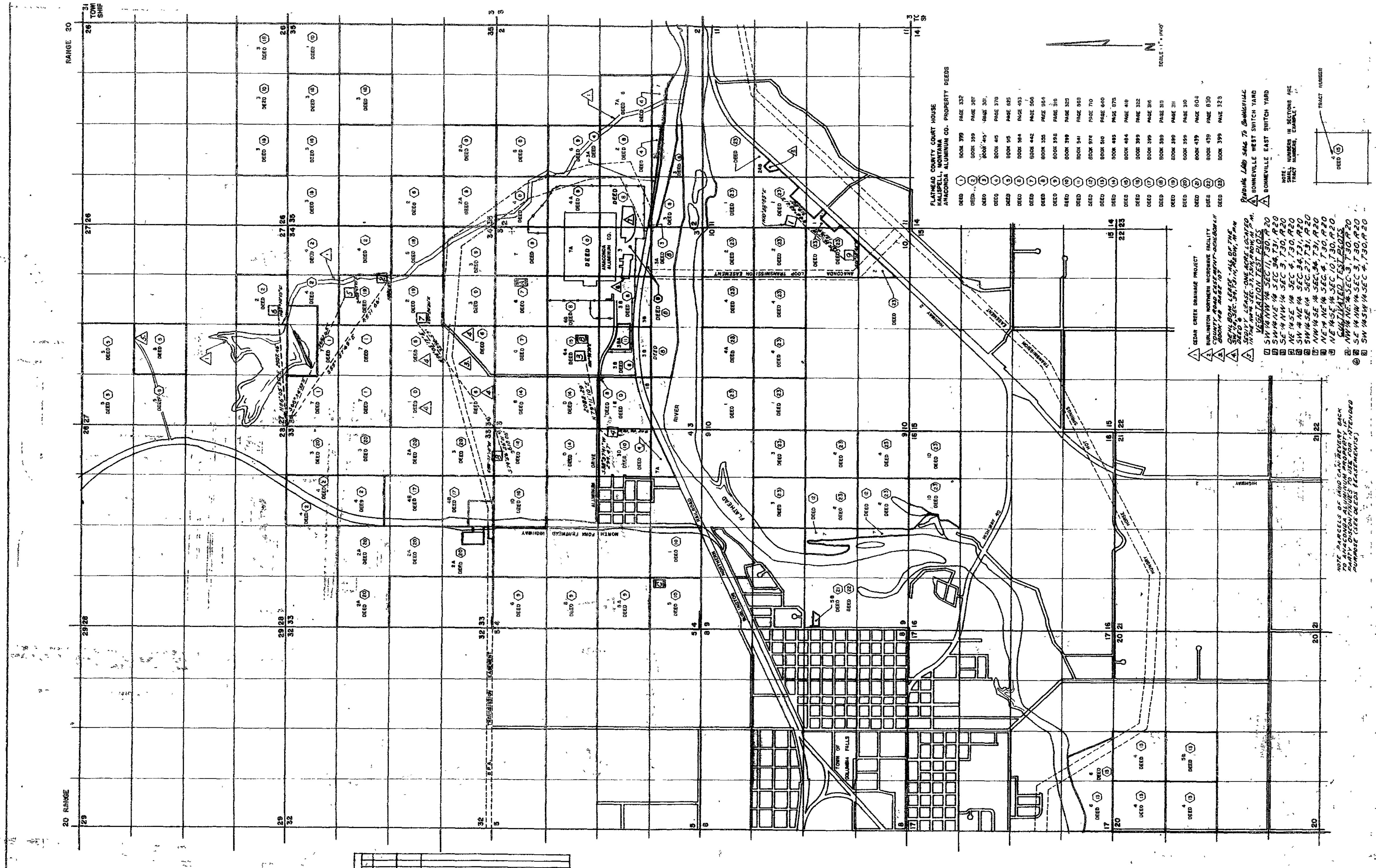
ARCO ALUMINUM

COLUMBIA FALLS, MONTANA

COLUMBIA FALLS DRAWINGS INDEX

DRAWING NO.	DESCRIPTION
U126	ARCO Metals Property
U150	Plant Facilities Location Map
AC9	Pot Room Layout
J1960	Cast House Layout





9	JCJ	2-18-82	Add BPA. Property & 4-100, DEED 8
NO	MADE BY	DATE	DESCRIPTION
(8)	CAR	1-8-81	Relocated Test Plot #9
(6)	Dee	6-10-81	Revise Description Test Plot "B"
(7)	Dee	9-11-81	Add note 3 re: Dahlbom Lane easement
(8)	Dee	10-13-81	Add note 4 re Sedivy Lease Agreement

NO	MADE BY	DATE	DESCRIPTION
(1)	J. Vehrs	10-5-79	[illegible]
(2)	"	"	23 ... 2, 24 to 23 and Deleted ...
(3)	"	"	deed #9
(4)	C A R	11-24-80	ADDED VEGETATION TEST PLOTS

DRAWN BY R. Villeras 5-23-79
TRACED BY
CHECKED BY J. Jahnsrud 6-79
APPROVED BY

THE ANACONDA COMPANY
ALUMINUM DIVISION
COLUMBIA FALLS, MONTANA

ITEM	NO. REQ.	DESCRIPTION	MAT'L	LOCATION	MARK OR PATT.	DETAILED ON DWG	REQ'N

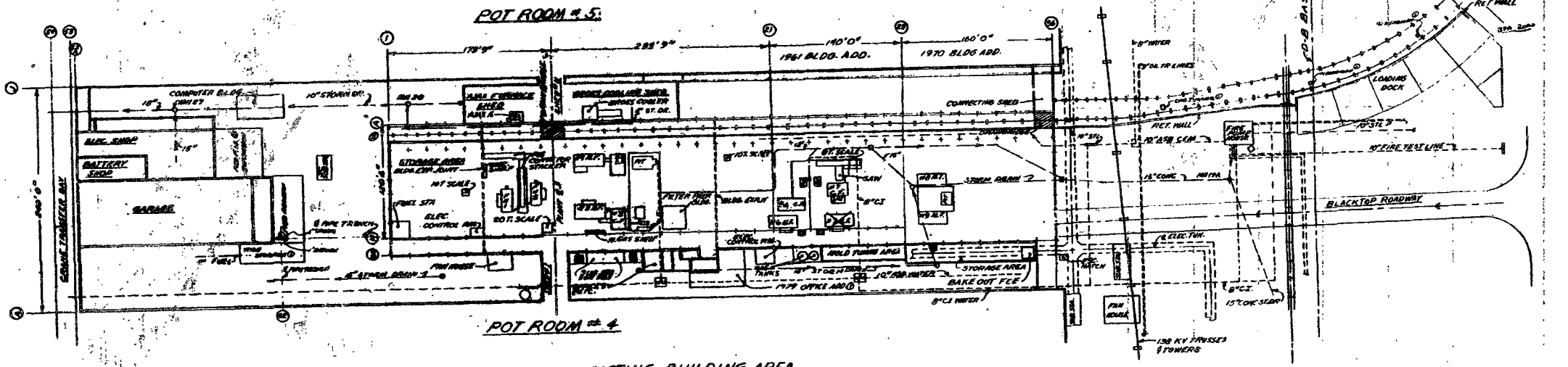
BILL OF MATERIAL

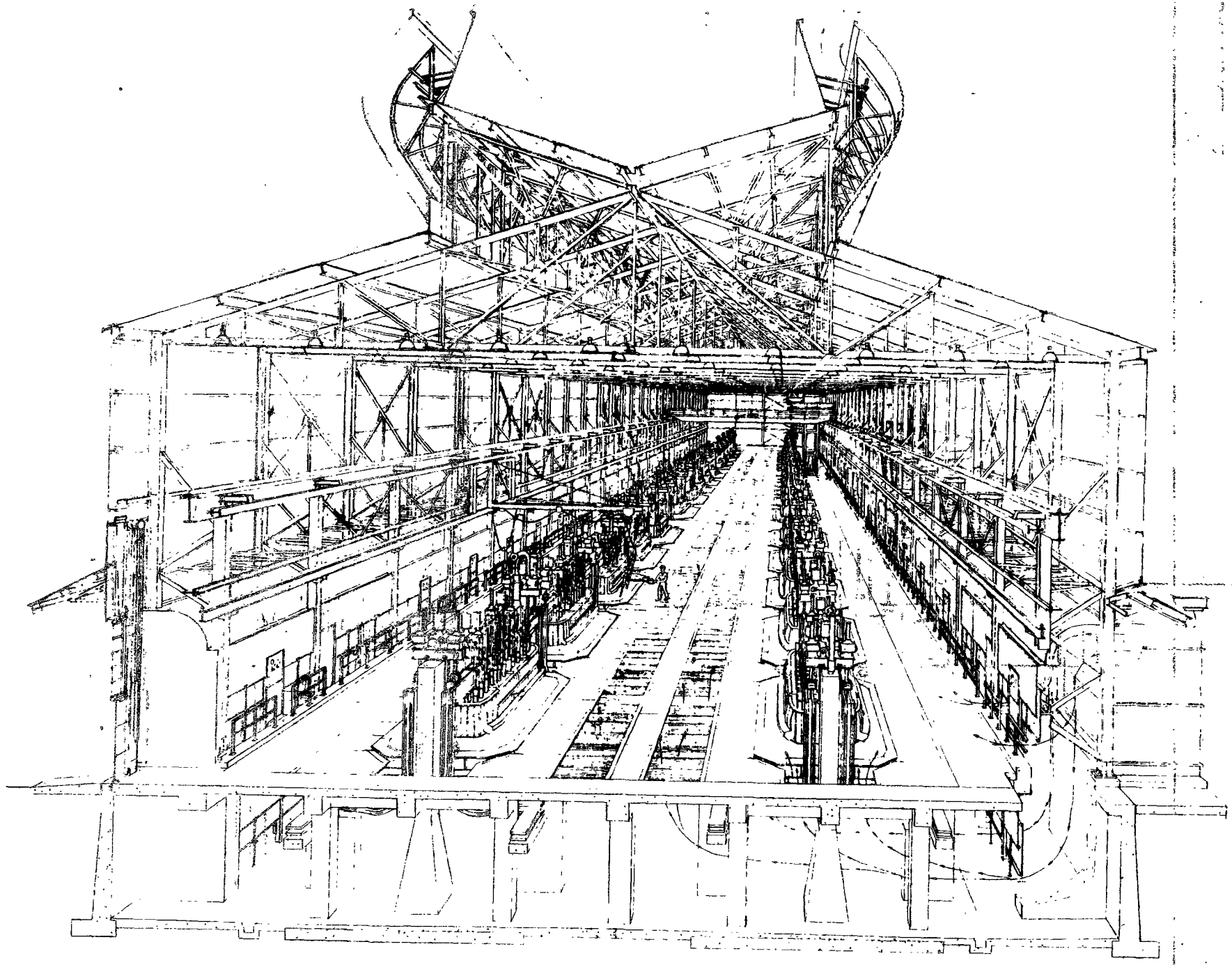
ANACONDA PROPERTY

DATE OF ISSUE 5/24/79
SCALE: 1" = 1000'

U-126

REVISION NO. 9





REFERENCE	ORD. No.	DESCRIPTION

REFERENCE	ORD. No.	DESCRIPTION

REFERENCE	ORD. No.	DESCRIPTION

REVISIONS	No.	MADE BY	DATE	DESCRIPTION

REVISIONS	No.	MADE BY	DATE	DESIGN PTIE -

DRAWN BY: C.F.FARUP 2-19-34
TRACED BY:
CHECKED BY:
APPROVED:

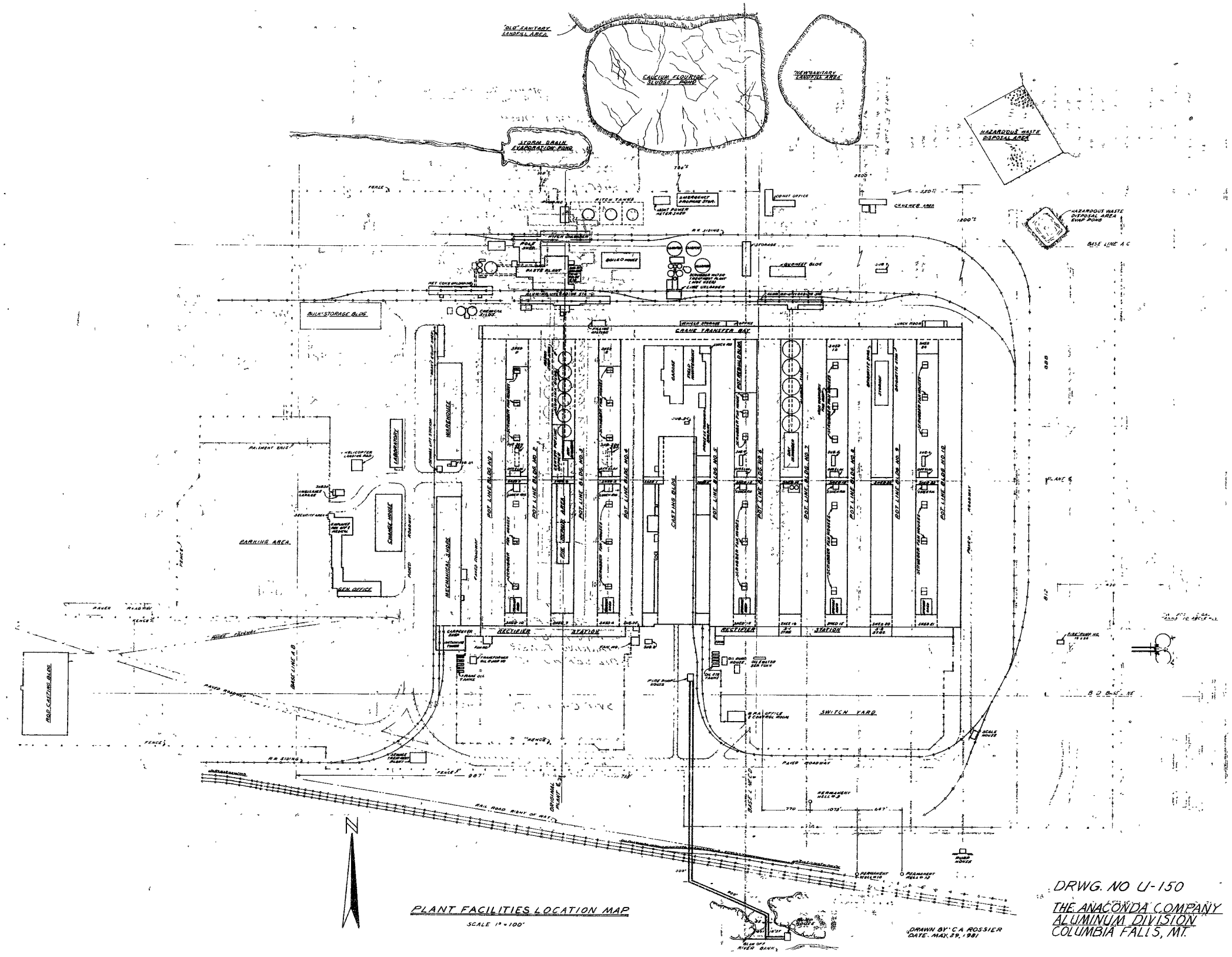
ANACONDA ALUMINUM COMPANY
COLUMBIA FALLS, MONTANA
ENGINEERING OFFICE NEW YORK, N.Y.

ITEM	NO. REQ.	DESCRIPTION	MAT'L	LOCATION	WGHT. OF PART	WEIGHT No. REQ.	GRP'S

BILL OF MATERIAL

POT LINES
PERSPECTIVE VIEW
POT LINE 1 LOOKING NORTH

DATE OF ISSUE
SCALE 1/2"=1'-0"



PLANT FACILITIES LOCATION MAP

SCALE 1" = 100'

DRAWN BY: C.A. ROSSIER
DATE: MAY 29, 1981

DRWG. NO U-150

THE ANACONDA COMPANY
ALUMINUM DIVISION
COLUMBIA FALLS, MT.